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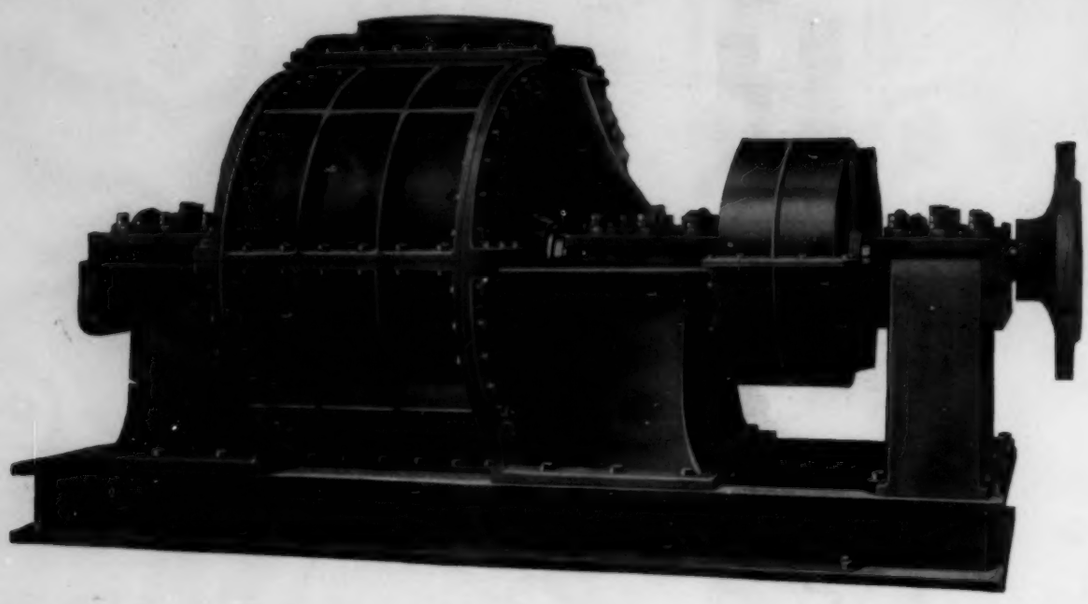
"CONNERSVILLE"



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CONNERSVILLE, IND.

NEW YORK
114 Liberty Street

THE IRON TRADE REVIEW

Vol. LX Cleveland, June 14, 1917 *No. 24*

Market Swept by Feverish Buying

Pig Iron Quickly Passes Historic $50 Price Line—Scrap Keeps Up Unprecedented Advance—Coke Jumps to New Mark—Heavy Buying of Steel for War in All Products Develops Steadily

WITH runaway conditions in pig iron, closely followed by scrap on one hand and constantly broadening preemption of finished steel and manufacturing capacity by the government on the other, buyers of iron and steel are finding themselves at the mercy of a genuinely war market. How and whether order and regularity are to be restored to present conditions are the big questions of the moment for the general trade. With the government systematizng plans to determine equitable costs of production with regard to its own purchases in an effort toward constructive economy, greater federal attention to the raw material end becomes a subject of renewed speculation. It is apparent from a consideration of the complex structure of pig iron costs that any supervisory policy in that product opens a broad and difficult problem of integrated operations in which labor shares prominently.

Pig Iron Rise Violent

Pig iron has gotten completely beyond the control of producers. The effect of the attainment of seemingly impossible price levels has been a scramble of consumers to cover all open needs and to vigorously gather in tonnage for the first half of 1918. This has led to a wild week in market valuations, the most unrestrained yet developed. Prices have jumped $5 to $7 further in the principal northern grades, until $50-iron as a historic event quickly has faded. Bessemer has eclipsed this memorable mark and has been sold in the week at $55, valley. Basic has kept pace, with large tonnages closed at $48 and $50, valley. This grade is exceedingly scarce for this year and middlemen are asking $52 for June and $53 for July and later. Malleable is commanding $50, valley, and small sales of foundry have been made as high as $53, valley. Buyers rushing into the market have been shocked to find furnaces booked up so heavily, even to July of next year. Some producers have only 5 to 10 per cent unsold to that date. Chicago, Detroit, Cleveland and Buffalo stacks are credited with bookings well in excess of 80 per cent of capacity for the first half. Heavy buying has featured all districts. At Pittsburgh, at least 50,000 to 75,000 tons of additional basic has been closed.

Scrap and Coke Follow

The flight in old material prices has been no less spectacular than in pig iron. Fluctuations have been from $1 to $10 per ton. Heavy melting steel is up to $40, Pittsburgh, $35 Chicago, and $35, eastern Pennsylvania. Shortages in some grades are more acute and buyers are having difficulty to fill their wants. Rerolling rails, which have been advanced to $50, or $10 to $12 above new rails, illustrates the situation. Spot furnace coke has risen to $11, ovens. Blast furnace interests are bringing pressure to have coke placed on the preferential shipping list and to arrange for a more equitable distribution of suitable cars.

No Limit to War Needs

Each new definite disclosure of government plans piles up tonnage of steel that will be called for now or later. Each development shows that original estimates of the percentage of finishing capacity that will be absorbed for war purposes must be sharply revised upward. The loss of approximately 300,000 tons in the May unfilled tonnage of the Steel Corporation, the first reduction in several months, reflects the manner in which capacity is being held off the market awaiting the taking form of government plans. Shell steel buying for contracts closed or in sight is coming forward actively. About 80,000 tons are about to be placed. If the plan to build 100,000 freight cars is carried out, 500,000 to 1,500,000 tons of steel, depending on the type, will be needed. An increase in the number of steel ships in the big merchant vessel program is under consideration. Conferences with the manufacturers as to the mill prices to prevail for the 1,000,000 tons or more of material required for these ships now are going forward. No fixed basis has been settled, but it is manifest that this will be considerably higher than the 2.90c and 2.50c agreement with the war and navy departments.

THE OPEN HEARTH

Load the Car Full

NEARLY three years of the bloodiest conflict known to man have driven home some important general facts. They have demonstrated that the nation richest in iron and steel resources is the strongest potentially in modern warfare on the material side. But the most potential necessarily does not mean the most effective. Man power must not only be provided and adequately trained, but properly distributed to apply advantages of industrial development for the attainment of the highest military results. Here transportation is one of the really great factors of war. Natural resources or human forces are futile without it. Armies must be moved to the battle line, and once there, must be furnished constantly and unceasingly with all their needs. The supply lines of an army are its vital points. To cut these means disaster. All the keenest strategy of the present major campaigns is aimed at the enemy transport.

Transportation has been a besetting problem of industry in this country during the past two years or more of war business. Available facilities under the methods of management in vogue have proved inadequate to meet the requirements of speeded-up prosperity. Now, with the nation actually at war, the fullest utilization of carrying capacity is demanded, not only on economic, but on military grounds. Upon it depends in a large measure how efficient the country will prove itself as a belligerent or as an ally to those who are depending upon it for supplies more than ever before.

The campaign for the fully loaded freight car now sweeping the country consequently has a deep significance. It is not only soundlly economic and practically patriotic, but is a genuinely military measure. The railroads, which have undertaken vigorously to teach shippers how to realize maximum carrying capacity, are serving their country well; shippers can do not less than co-operate to their utmost power. Likewise, both the railroads and the shippers are putting themselves in a position where they, when peace returns, can reap material benefits from the lessons and methods forced upon them by the exigencies of war.

Conserve Man-Power

AS SOON as the United States awoke to the necessity of preparedness for war, an urgent call went out for materials, money and men. The huge shipbuilding program promises to solve the problem of materials; the liberty loan is providing the money; and enlistments and selective draft are building up the army and navy. In the excitement attending these three great movements, the fact that every addition to the military force means a corresponding depletion in the industrial army is apt to be overlooked. In fact, unless a united effort is made to counteract the exodus from the ranks of labor, the country is robbing Peter to pay Paul.

It is patent that the armed force of the nation must be recruited with the least possible detriment to the organization of the industries engaged in making war supplies. This means that the man-power must be conserved with the utmost efficiency and that the thinning ranks of labor should be filled wherein it is possible to do so. The engineer or manufacturer who can operate his plant with 1500 men whereas he required 2000 before the war is doing a patriotic service equally as valuable as that of the man who subscribes heavily to the Liberty loan. In the same manner the employer who adjusts his organization so that he can hire women in place of men of military age is saving man-power and helping the nation.

In a few months we will witness a situation in America that has existed in England for many months. Employers will claim exemption for their employes on the ground that they are needed to keep the organization for producing war materials intact. It is the duty of every manufacturer to anticipate this situation, and to put his house in order so that he can release the greatest number of men of military age for federal service with the least interruption to the routine of manufacturing.

Give Us Ships With the Tariff

DECISION of the United States tariff commission to postpone indefinitely its trip abroad is well taken. Those countries where the most study is required are in an upheaval of strife. Conditions are utterly abnormal. The law of economics and trade has been cast aside. The basis upon which business was conducted before the war may never return. A new order of things will follow the establishing of peace. Trade alliances of sweeping character are in contemplation. Whether this nation is or is not a participant in such alliances, it will be affected greatly by them.

It seems certain that there will be the sharpest competition after the war that the world ever has seen. Prodigious efforts will be made by all belligerent countries which have lost markets to regain them. Others will be equally as active not only in trying to hold new trade they have built up, but also to expand their business still further. It is the plan of the United States to make vast increases in its foreign commerce. With this end in view, it is now entering upon a program for the upbuilding of a

THE OPEN HEARTH

merchant marine, although the first use of the vessels is as carriers of supplies for the safe conduct of the war. Of course, if these vessels are to be the foundation for a real merchant marine, they will have to be disposed of by the government to private interests, and legislation enacted by which, among other things, they will receive aid from the government to offset the advantages accruing to foreign merchant fleets. These advantages may be heightened after the war. It becomes absolutely necessary therefore that this government change entirely its past policy which robbed it of a merchant fleet and substitute a constructive plan.

Everything being topsy turvy, it is evident the tariff commission could not make a study abroad at this time that would be of enduring value. It is well that it has postponed its trip until it can make a thorough study of the field which must be preliminary to the most important tariff revision in the history of the country. Associated with this also must be other sound legislation, including that relating to the merchant marine.

Famine Prices Are Appearing

SPECTACULAR advances in quotations on standard steel commodities since June 1, lead to the belief that a famine in steel is developing rapidly. With anxious consumers scrambling for material, price records are being broken almost daily. Many pig iron merchants and rolling mill managers temporarily have withdrawn from the market, to protect their own resources, admitting that they cannot keep pace with the procession.

Pig iron, advancing at the rate of approximately $1 a day, has held the center of the stage for several weeks past. Since June 1, bessemer has jumped $9, basic $8 and foundry and malleable irons $6.50 a ton. All grades now are held at $50 or above by sellers in western Pennsylvania, eastern and northern Ohio. Bessemer has commanded $55 a ton. In consonance with higher quotations on pig iron, iron and steel scrap has registered advances ranging from $5 to $15 a ton in the last 10 days. Heavy melting steel has been sold at $40 a ton in the Pittsburgh district; talk of $50 is heard frequently.

Connellsville coke has contributed to the excitement. Blast furnace fuel has advanced $1 for spot shipment and contract coke $1.50 a ton, since June 1; similar records have been made by foundry coke. Figures showing the weekly output of beehive ovens in western Pennsylvania indicate that the production of coke has been below normal for several months. Moreover, the car supply has been insufficient to meet demands of steel works and merchant furnaces.

With furnace and mill capacity mobilized for military purposes, it is not surprising that famine prices prevail, since not much surplus tonnage was being produced before this country entered the titanic struggle for democracy. Until the general situation adjusts itself, consumers will either have to make sacrifices or pay phenomenally high prices for supplemental tonnages and future requirements. A central western tank maker has just paid 8 cents a pound for 1000 tons of steel plates, which nominally are listed at 4.50c for delivery at the convenience of the mill. Black, galvanized and blue annealed steel sheets, all of which are entering the manufacture of munitions, have advanced $5 a ton since June 1. Not more than a half dozen central western sheet-makers are figuring in the domestic market. Steel chain, large quantities of which are being purchased for ship cables, now is selling at $10 a ton above the price offered 10 days ago. Rivets, for structural and boiler work, have advanced $5 a ton this week, and railroad spikes are up $10 a ton. Cold-rolled strip steel was marked up $10 a ton a few days ago.

The upward movement of the iron market has not been arrested; in fact, the peak is not yet in sight. While veteran market authorities and observers declare that the industrial resources of this country are sufficient to meet military and domestic demands, yet indications are that it will take some time to make necessary adjustments. In the meantime, quotations likely will continue to rise sharply all along the line until prices which now seem phenomenal may be outdistanced.

Art and Science in Industry

MODERN science and efficiency leave little room for sentiment and art in the operation of today's tremendous industrial forces. Experts seem to abhor anything that savors of old-school methods. An occasional encounter with one of the industrial arts that served to give the early iron masters their enviable reputations is truly as refreshing a relief from the hum drum of modern routine as a spanking sea breeze. The production of crucible steel by methods which gave Sheffield its world-wide fame stands out as a striking example of art combined with skill whose individualism has been unsullied by cold, uncompromising science. The craft of making this steel has been handed down from father to son for generations. Science now has come to its aid by supplying American-made crucibles to supplant those formerly made of German clay. The domestic product is not so good as the foreign article, but its quality is improving rapidly. In spite of our love for art, it appears that science cannot be entirely divorced from any branch of industry.

Iron and Steel Prices

Corrected to Wednesday Noon

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 1000

PIG IRON

(Delivery this year.)

Bessemer valley	$55.00
Bessemer, Pittsburgh	55.95
Basic, Pittsburgh	50.95
Basic, eastern Pa.	42.00 to 44.00
Basic, Buffalo	48.00 to 50.00
Malleable, Pittsburgh	50.95 to 53.95
Malleable foundry, Chicago	50.00 to 51.00
Malleable foundry, Phila.	47.00 to 48.00
Malleable foundry, Buffalo	48.00 to 50.00
No. 1X foundry, Phila.	45.25 to 47.25
No. 2 foundry, Pittsburgh	50.95 to 53.95
No. 2 foundry, Cleveland	46.00 to 47.00
No. 2 foundry, Ironton	42.00 to 43.00
No. 1 foundry, Chicago	51.00 to 52.00
No. 2 foundry, Chicago	50.00 to 51.00
No. 2X foundry, Phila.	44.75 to 46.75
No. 2X foundry, N. J. tide	44.75 to 46.75
No. 2X foundry, Buffalo	47.00 to 50.00
No. 2 plain, Philadelphia	44.50 to 46.50
No. 2 plain, N. J. tide	44.50 to 46.50
No. 2 plain, Buffalo	46.00 to 47.00
No. 2 southern, Birmingham	39.00 to 40.00
No. 2 southern, Cincinnati	41.90 to 42.90
No. 2 southern, Chicago	42.00 to 44.00
No. 2 south'n, Phila. delivery	43.50 to 45.50
No. 2 southern, Cleveland	42.00 to 43.00
No. 2 south'n, N. Y. docks	43.25 to 45.25
No. 3 south'n, Boston docks	43.50 to 45.50
No. 2 south. Interior, N. E.	44.00 to 46.00
No. 2 southern, St. Louis	43.40 to 45.40
Virginia No. 2X, furnace	43.00 to 45.00
Virginia No. 2X, Phila.	45.75 to 47.75
Virginia, No. 2X, Jersey City	46.00 to 48.00
Virginia No. 2X, Boston	46.25 to 48.25
Gray forge, eastern Pa.	42.00
Gray forge, Pittsburgh	49.95
Gray forge, Birmingham	38.00
Silveries 8 per cent, furnace	50.00 to 52.00
Silveries, 8 per cent, Chicago	53.00 to 54.00
Low phos. standard, Phila.	78.00 to 80.00
Low phos. Lebanon, furnace	75.00 to 80.00
Low phos., Pittsburgh	70.00 to 75.00
Charcoal, Superior, Chicago	49.25 to 51.75
Charcoal, Buffalo	52.00 to 53.50
Charcoal, Birmingham	45.00 to 50.00

COKE

(At the ovens.)

Connellsville furnace	$10.50 to 11.00
Connellsville furnace, contract	8.50 to 9.00
Connellsville foundry, contract	11.00 to 11.50
Connellsville foundry	10.50 to 11.50
Wise county furnace, contract	7.00 to 9.00
Wise county foundry, contract	8.00 to 10.00
Pocahontas furnace, contract	7.00 to 9.00
New River foundry, contract	10.50 to 11.00
New River furnace, contract	7.50 to 10.00

FERRO ALLOYS

Ferro manganese, prompt	$400 to 450
Ferro manganese, last half	400 to 425
Spiegeleisen, 20 per cent furnace remainder of year	75.00 to 85.00
Ferrosilicon, 50 per cent, Pitts.	250 to 260
Ferrosilicon, 50 per cent, Pitts., 1st quarter	150.00
Bessemer ferrosilicon, 9 per cent	$74.00
Bessemer ferrosilicon, 10 per cent	75.00
Bessemer ferrosilicon, 11 per cent	77.50
Bessemer ferrosilicon, 12 per cent	80.00
Bessemer ferrosilicon, 13 per cent	85.00

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O., furnaces.

SEMI-FINISHED MATERIAL

BILLETS

Open hearth, Pittsburgh	$95.00
Open hearth, Philadelphia	90.00 to 100.00
Open hearth, Youngstown	95.00
Bessemer, Pittsburgh	95.00
Bessemer, Youngstown	95.00
Forging, Pittsburgh	115.00
Forging, Philadelphia	115.00
Forging, Chicago	100.00

SHEET BARS

Open hearth, Pittsburgh	$100.00
Open hearth, Youngstown	100.00
Open hearth, Cleveland	100.00
Bessemer, Pittsburgh	100.00
Bessemer, Youngstown	100.00

WIRE RODS, MUCK BAR, SKELP.

Wire rods, Pittsburgh	$90.00 to 95.00
Muck bar, Pittsburgh	80.00
Grooved skelp, Pitts., nom.	4.00c
Sheared skelp, Pitts., nom.	4.50c

SHAPES, PLATES AND BARS

Struc. shapes, con. Pitts.	4.00c to 4.50c
Structural shapes, Phila.	4.409c to 4.659c
Structural shapes, N. Y.	4.419c to 4.669c
Structural shapes, Chicago	4.69c to 5.44c
Tank plates, Chicago	8.00c to 9.00c
Tank plates, Pitts. (con.)	4.50c to 5.50c
Tank plates, Pittsburgh	8.00c to 9.00c
Tank plates, Philadelphia	5.159c to 10.159c
Tank plates, New York	5.169c to 10.169c
Bars, soft steel, Chicago	4.75c to 5.00c
Bars, soft steel, Pittsburgh	3.50c to 4.00c
Bars, soft steel, New York	4.169c to 4.419c
Bars, soft steel, Phila.	4.159c to 4.409c
Cotton ties, Pitts., June	$2.10
Bar iron, Chicago	4.00c
Bar iron, Philadelphia	4.159c
Bar iron, Cleveland	3.50c
Bar iron, New York	4.169c
Bar iron, Pittsburgh	4.25c
Hard steel bars, Chicago	4.00c

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh, base	3.25c
Angle bars, Chicago, base	3.25c
Standard bessemer rails, mill	$38.00
Stand. open hearth rails, mill	40.00
Light rails, 25 to 45 lbs., Chic.	60.00
Light rails, 25 to 45 lbs., Pitts.	60.00
Relayers, standard, mill	38.00 to 40.00
Relayers, light, Chicago	40.00
Relaying rails, light, St. L.	$5.00 to 58.00
Spikes, railroad, Pittsburgh	4.25c to 4.50c
Spikes, railroad, Chicago	4.00c to 4.15c
Track bolts, Pittsburgh	5.50c to 8.00c
Track bolts, Chicago	5.00c to 5.15c
Tie plates, Chicago	$60.00 to 65.00

WIRE PRODUCTS

(To jobbers; retailers 5 cents more.)

Wire nails, Pittsburgh	$3.50 to 3.60
Coated nails, Pittsburgh	3.50 to 3.60
Plain wire, Pittsburgh	3.45 to 3.55
Galvanized wire, Pittsburgh	4.15 to 4.25
Polished staples, Pittsburgh	3.65 to 3.75
Galvanized staples, Pittsburgh	4.35 to 4.45
Barb wire, painted, Pittsburgh	3.65 to 3.75
Barb wire, galvanized, Pitts.	4.35 to 4.45
Cut nails, Pittsburgh	4.25c to 4.50c

CHAIN, PILING, STRIP STEEL

Chain, ¾ in. proof coil, Pitts.	7.00c
Sheet piling, base, Pittsburgh	3.50c to 4.00c

Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 8.00c to 8.25c.

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SHEETS

(In cents per pound.)

SHEET MILL BLACK.

No. 28, open hearth, Pitts.	8.00c to 9.00c
No. 28, bessemer, Pitts.	7.90c to 8.90c
No. 28, open hearth, Chgo.	7.69c to 8.19c

TIN MILL, BLACK

No. 28, open hearth, Pitts.	8.00c to 9.00c
No. 28, bessemer, Pitts.	7.90c to 8.90c

GALVANIZED

No. 28, open hearth, Pitts.	10.00c to 10.75c
No. 28, bessemer, Pitts.	9.90c to 10.65c
No. 28, open hearth, Chgo.	9.69c to 10.19c

BLUE ANNEALED

No. 10, open hearth, Pitts.	7.50c to 8.50c
No. 10, bessemer, Pitts.	7.40c to 8.40c
No. 10, open hearth, Chgo.	7.19c to 7.69c
No. 10, open hearth, Phila	8.159c

TIN PLATE

(Per 100 lb. box.)

Tin plate, coke base, nom.	8.50c to 11.50c
Terne plate, I. C. nominal	7.15c to 8.00c
Terne plate long, nominal	8.00c

IRON AND STEEL PIPE

(Prices adopted May 1, 1917.)

Steel

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
⅜ to 3, butt	49	35½

Iron.

(Prices adopted May 1, 1917.)

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
⅜ to 1½, butt	38	22

BOILER TUBES

(Price adopted April 2, 1917.)

Steel, 3½ to 4½ inches, l. c. l.	34
Iron, 3½ to 4½ inches, l. c. l.	28

CAST IRON WATER PIPE

(Class B Pipe.)

Four-inch, Chicago	$61.50
Six-inch and over, Chicago	58.50
Four-inch, New York	61.50
Six-inch and over, New York	58.50
Four-inch, Birmingham	58.00
Six-in. and over, Birmingham	55.00

Class A pipe is $1 higher than Class B.

HOOPS, BANDS, SHAFTING

Hoops, Pittsburgh	6.00c to 6.25c
Bands, Pittsburgh	5.75c to 6.00c
Shafting, Pittsburgh, carloads	5 off to list

RIVETS

Structural rivets, Pittsburgh	5.00c
Boiler rivets, Pittsburgh	5.10c
Tinner's rivets, Pittsburgh	40 off

NUTS AND BOLTS

(Delivered within 20-cent freight radius.)

CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter.)

Rolled thread	40
Cut thread	35 and 2½
Larger or longer	25

MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts.)

Rolled thread	40 and 10
Cut thread	40
Larger and longer	30
Cold pressed, semi-finished, hexagon nuts	50 and 10
Gimlet and cone point lag bolts	45

NUTS

Hot pressed, square, blank	$2.10 off
Hot pressed, square, tapped	1.90 off
Cold pressed, square, blank	1.70 off
Cold pressed, square, tapped	1.50 off
Hot pressed, hexagon, blank	1.60 off
Hot pressed, hexagon, tapped	1.40 off
Cold pressed, hexagon, blank	1.60 off
Cold pressed, hexagon, tapped	1.40 off

(*For miscellaneous prices see page* 1319.)

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products June, 13 average for May, 1917, average for March, 1917, and average for June, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices June 13, 1917.	Average prices May, 1917.	March, 1917.	June, 1916.
Bessemer pig iron, Pittsburgh..	$55.95	$44.95	$37.45	$21.95
Basic pig iron, Pittsburgh.....	50.95	42.15	32.85	18.95
No. 2 Foundry pig iron, Pitts..	50.95	43.55	36.50	19.50
No. 2 Foundry pig iron, Chgo..	50.00	43.25	35.75	19.00
Lake Superior Charcoal, Chicago	52.00	49.25	37.50	19.75
Malleable, Chicago	50.00	43.25	35.75	19.50
Southern No. 2, Birmingham...	39.00	35.75	24.50	15.00
Southern Ohio No. 2, Ironton.	42.00	38.60	33.00	18.50
Basic, eastern Pa.....	45.00	40.75	34.50	19.25
No. 2X Virginia, furnace.....	45.00	41.00	34.00	18.00
No. 2X foundry, Philadelphia...	45.00	43.25	37.25	20.00
Ferro mang., delivered.....	425.00	425.00	275.00	175.00
Bessemer billets, Pittsburgh....	90.00	85.00	67.00	41.25
Bessemer sheet bars, Pittsburgh	90.00	88.00	67.00	41.25
Open hearth sheet bars, Pitts..	100.00	88.00	67.00	41.25
Open hearth billets, Pittsburgh.	100.00	85.00	67.00	41.25
Steel bars, Pittsburgh contract.	3.50	3.50	3.21	2.50
Steel bars, Chicago.....	3.94	3.84	3.40	2.69
Iron bars, Philadelphia.....	4.159	4.109	3.509	2.559
Iron bars, Cleveland, local del'y.	3.50	3.25	3.00	2.40
*Seaboard				

	Prices June 13, 1917.	Average prices May, 1917.	March, 1917.	June, 1916.
Iron bars, Chicago mill.....	$4.00	$3.39	$3.00	$2.35
Beams, Chicago	4.44	4.34	3.65	2.69
Beams, Pittsburgh contract.....	4.00	4.00	3.46	2.50
Beams, Philadelphia	4.659	4.659	3.759	2.659
Tank plates, Pittsburgh contract	4.50	4.50	4.20	2.75
Tank plates, Chicago.....	7.69	5.49	4.59	3.09
Tank plates, Philadelphia.....	10.159	7.559	5.659	3.909
Sheets, blk., No. 28, Pittsburgh	8.00	7.00	5.05	2.92
Sheets, blue anld., No. 10, Pitts.	7.50	6.65	4.70	3.10
Sheets, galv., No. 28, Pittsburgh	10.00	8.82	6.72	4.79
Wire nails, Pittsburgh.....	3.50	3.50	3.16	2.50
Connellsville fur. coke, contr...	8.50	8.00	7.60	2.60
Connellsville fdy. coke, contr...	9.50	8.50	6.90	3.50
Heavy melting steel, Pittsburgh	40.00	28.40	23.50	16.25
Heavy melting steel, eastern Pa.	31.00	26.00	23.75	15.75
Heavy melting steel, Chicago...	34.00	28.75	23.00	15.25
No. 1 wrought eastern Pa.....	44.00	40.75	30.50	20.75
No. 1 wrought, Chicago.....	40.50	32.50	25.75	15.25
Rerolling rails, Chicago.....	45.00	36.75	27.25	16.25
Car wheels, Chicago.....	36.00	27.25	20.25	12.50

(For Additional Prices See Page 1319)

Feverish Buying Brings Sharp Rises

Fifty Dollar Iron Becomes General—Bessemer Sells at $55, Basic and Malleable at $50 and Foundry at $53, Valley—Buyers Find Many Furnaces Sold Up Heavily to July, 1918

Pittsburgh, June 12.—Pig iron melters, foreseeing what may develop into an acute shortage of metal, are covering future requirements with feverish activity. Not much additional tonnage is available for distribution this year. Blast furnaces in adjacent territory, including the Chicago, Detroit, Cleveland and Buffalo districts, are reported to have sold approximately 75 per cent of their output for shipment the first six months of 1918. Valley furnaces are in a somewhat better position. Believing that deferred deliveries of Connellsville coke partly are responsible for the recent decrease in production of pig iron several merchant furnaces have appealed to the national defense council for relief. While demand is equally as heavy as it was the early part of last year, pig iron production the first five months of 1917 was about 370,000 tons below that of the corresponding period of 1916. Beehive oven coke and limestone likely will be placed upon the preferential shipping list at an early date. Ever since reports of $50 iron first were published, melters have been scrambling wildly for metal. Virtually every consumer in the district is figuring directly or indirectly for iron. Rapidly advancing prices have caused no diminution in activity. Immediately following the sale of 15,000 tons of basic at $48, valley, 25,000 tons were sold last Friday at $50, valley, to a western Pennsylvania steel works. Follansbee Bros., who closed a week ago for 6000 tons of basic at $45 for delivery before Dec. 31, next, now are closing on about 18,00 tons for first half of 1918. The American Steel Foundries, Chicago, is buying 10,000 tons of basic and about 7500 tons of bessemer; the American company has paid $50, valley, for a sizeable tonnage of the latter grade. A northern Ohio consumer has closed for 1000 tons of bessemer at $55, valley. That figure represents the going market. The American Rolling Mill Co., Middletown, O., is negotiating for ingot molds. Foundry and malleable have sold in 100 to 300-ton lots at $53, valley. A local melter took 600 tons of prompt malleable at $53.

Baldwin Closes Tonnage

Philadelphia, June 11.—The Baldwin Locomotive Works has closed for 14,000 tons of 2.50 to 3.25 and 1 to 1.40 per cent silicon foundry iron for delivery at the rate of 600 tons weekly, beginning November, to its plant at Eddystone, Pa. The business was divided between two eastern Pennsylvania furnaces, 8000 tons going to one and 6000 tons to another. In addition, the Baldwin company closed for considerable prompt foundry. Numerous other small tonnages of foundry have been placed. Prices on foundry have shown an unusual spread this week. Eastern Pennsylvania No. 2X was sold in one case as low as $40 and in others at $42 to $44, furnace, for prompt. Most of the business, however, brought more, and for last half considerable tonnage went at $47. The general market for this year is quoted at $44.50 to $46.50, delivered Philadelphia, for No. 2X. On No. 2X for first half the general market is $41.50 to $43.50, Philadelphia, with asking prices up to $44 and $45, furnace. Some small lots have gone at $45, furnace, for first half, while considerable tonnages for late this year and extending into next have been closed around $45, furnace. Fair-sized tonnages of Virginia No.

(*For miscellaneous prices see page* 1319.)

2X for this year have been sold at $45, furnace. It is becoming increasingly difficult to get Virginia iron for this year. One Virginia maker, who has been quoting $45 and $45.50, furnace, for this year, has advanced to $46.50. The minimum on central Pennsylvania foundry for this year now appears to be $46, furnace. Sales of small lots have been made at $45, furnace, and some of the furnaces in that district ask as high as $50 for first half. The market in basic is quiet and is nominally at $42 to $44, delivered eastern Pennsylvania. Low phosphorus iron, outside of sales of further tonnage to the government at a material concession, is featureless

Buying Pressure Steady

Buffalo, June 12.—The sales of the past week have not exceeded 5000 tons due to the sold up condition of the furnaces. While the buying pressure has been steady the activity has been modified for this reason. One of the leading producing interests of the district has withdrawn practically from the market for all selling periods owing to the unsatisfactory condition of labor scarcity of coke and other conditions. While most of the furnaces are sold up for the remainder of the year, there is little disposition to open books generally for 1918 business. The range has stiffened for 1917 deliveries, where available, so that No. 2X foundry now is being quoted at $47 to $50. The minimum on lower grades is $46. Charcoal iron now is quoted at $52 to $53.50.

East Gets into $50 Class

New York, June 12.—No. 2X foundry iron at $50, furnace, for last quarter, and at $48, furnace, for first quarter, today became actualities in this district on sales of substantial tonnage. Iron constantly is growing scarcer and for a long period ahead, and this condition, despite the fact that the market now is less active than in recent weeks, is responsible for the unusual price advances. While some small business in prompt foundry was done as low as $43 and $44, eastern furnaces, during the week, these figures have been exceptional and $45 to $46, eastern Pennsylvania, is the range below which it now would be difficult to go for this year. Most makers want from $46 to $50, furnace, for iron for this year. On first half, price views also are hardening rapidly and $42 to $43, furnace, is minimum for No. 2X. In most cases, however, higher is wanted and the disposition to quote no concession for next year as compared with this year, is growing. A leading Buffalo maker who recently was quoting $43, Buffalo, on first quarter, now is asking $46.50, Buffalo, on second quarter and has nothing left for earlier shipment. A Connecticut consumer has closed for 3000 tons of No. 2X for last quarter and first quarter. Another New England melter placed 3000 tons of No. 2X for first half. A Pennsylvania maker sold some 4000 tons of malleable for first half in this district at $46, furnace, and now is out of the market. The Norfolk & Western railroad has taken 500 tons of Virginia for this year and still is inquiring. An eastern consumer has taken several thousand tons of basic for first quarter at $45, eastern Pennsylvania furnace, and this now appears to be the minimum. Bessemer has been sold in the east at $47 to $49, furnace. An eastern Pennsylvania maker took 1000 tons of bessemer for Pittsburgh district shipment. Export demand continues active and the market is stronger. Vessel space available has increased.

Delivers Steel Orders by Boat Route

On account of the congested railroad traffic conditions, the Pittsburgh Iron & Steel Foundries Co., Pittsburgh, has adopted a rather unique method of serving its trade in Pittsburgh and vicinity. The company recently purchased a steamboat, christened the ADAMITE, which now is plying between the company's works at Midland and Pittsburgh, delivering material to consumers on the Ohio, Allegheny and Monongahela rivers. The company is also providing special auto truck service to its patrons in the Pittsburgh district.

Prices Rise Furiously

Cleveland, June 12.—Advances of from $5 to $7 per ton has made the week in pig iron the most remarable this district has yet witnessed. Buyers have been rushing into the market only to find the supply exceedingly scarce for this year and that a number of the furnaces have very little to offer even for the first half of 1918. In fact, in various instances, consumers have been obliged to accept a pro rating of their inquiries by different furnaces based on the amount of free iron left. Basic for this year is very scarce. Middlemen who have tonnage to offer, are asking $52 valley for June and $54 for July delivery. A local steel maker who bought early bessemer at $55 valley, has been figuring on 15,000 or 20,000 tons of basic for first half and is reported to have closed. For that period, $50 valley has been quoted. A large local malleable consumer inquired for 3000 tons for this year but had difficulty in placing this business. One lot of 1000 tons was placed at $50 valley basis or $50.95 Cleveland. On 250 tons of prompt malleable about $51.25 Cleveland or $50 furnace was paid. Eastern interests paid $48 western Pennsylvania furnace for next year's malleable or about $50.75 delivered. The Westinghouse Electric & Mfg. Co. is inquiring for 12,000 tons from its 1, 2, and 3 foundry classifications for its Cleveland plant. One maker sold about 1000 tons of foundry for this year at $53 valley. On a small lot of prompt No. three, $50 Cleveland furnace was named. For first half $46 southern Ohio or $47.62 Cleveland was paid, but the price is higher now. Some foundry sellers are holding for $50 minimum. Low phosphorus now is selling at $80 furnace and fair sized tonnages have been sold at that figure for this year by eastern Ohio makers. Some sales for next year also have been made at the same figure. Tennessee low phosphorus in sizable lots has been closed at $80 furnace in middle western territory. The car supply situation was improved this week.

Chicago Iron Reaches $50

Chicago, June 12.—On renewed inquiry and sales of prompt iron at $50, furnace, Chicago makers have raised their quotation to $50, furnace, for all grades and all deliveries. Sales have not yet been made for last half or for first half of 1918 at this figure.

Buyers are evincing more interest in the market than has been the case during the past fortnight. It is estimated that about 10 per cent of the production for last half remains unsold and about 15 per cent of the production for first half is not yet under contract. Users of basic iron are not entering the market and the only inquiry recently is one for 3500 tons, on which $50, Chicago furnace, has been quoted by a local maker. Southern iron is quiet with prompt iron at $43, Birmingham, and last half quoted at $41 to $43, Birmingham. For first half of 1918 the market appears to be $40 to $42, Birmingham. Much disappointment has come to melters on account of poor delivery of southern iron bought previously at much lower prices than now prevailing. This situation has forced them into the spot market. The car situation at Birmingham is said to be the worst ever experienced. Southern producers are not anxious to sell heavily and many are completely sold for the remainder of this year.

(*For miscellaneous prices see page* 1319.)

One maker will accept business at $42, Birmingham, for last quarter and $40, Birmingham, for first half, providing the latter tonnage is double the former.

Lake Superior charcoal is strong and a recent quotation was $52.50, furnace, on 200 tons of A. Scotch. Some makers are sold up for the remainder of this year. Some small selling has been done for 1918 delivery. The situation in silveries is difficult. It seems practically impossible to buy further silveries from Jackson county or southern makers for this year. From southern makers some first half metal can be obtained. No quotations exist and every proposition is being quoted on its individual merits.

Alabama Adds Strength

Birmingham, Ala., June 12.—Pig iron is difficult to obtain for last half delivery. Some of the furnaces are out of the market and can give regular customers but little iron. Quotations have added strength and $40 generally is asked for No. 2 foundry. Special brand and special analysis irons command $42 and $42.50. While there are numerous inquiries in the market, there have not been many sales lately. Considerable export iron, sold several months ago, is moving again. Not a little of the iron now moving was sold at $25 and under. Production in Alabama is being increased right along. The Shelby Iron Co. will be the next to start an old furnace. The Tennessee Coal, Iron & Railroad Co. is practically rebuilding the little furnace at Bessemer.

Scarcity is More Acute

St. Louis, June 11.—Users of pig iron in this district with contracts for finished and semi-finished materials are becoming more concerned relative to future supplies of pig iron. Their activities in the direction of covering have added to the excitement of the market. The past week has developed absolutely no relief in the situation. On the contrary, the market has gotten more barren because of the deplorable car situation and general transportation inadequacy. Prices are very firm. Everything has been disposed of for weeks ahead. No. 2 southern foundry is quoted at $43.40 to $45.40, nominally, but it would be impossible to acquire any considerable tonnage even at the high figure of this spread.

Prices Stimulate Inquiry

Cincinnati, June 11.—Coincident with the marking up of quotations in the different producing districts, inquiries from different sources have multiplied. The bulk of these inquiries is for small lots of foundry iron for first half, although some melters are yet under the necessity of buying more iron to carry them through the present year. A round lot of basic iron was sold by an Ohio furnace for shipment to St. Louis territory during the first half. The Westinghouse Electric & Mfg. Co. has put out an inquiry for about 5000 tons of foundry iron for first half and the Platt Iron Works at Dayton for 400 tons each of northern and southern foundry for the same position. It is generally reported that a number of foundry iron consumers were able to cover for various small tonnages before prices were marked up to the present level. Southern furnaces are quoting today No. 2 foundry at $40, Birmingham, for first half of next year, and around $42 for this year. There is very little southern Ohio iron to be had for this year. The small amount to be had for first half is being held back by the furnaces probably with the idea of taking care of old customers' wants later on. The only quotation on No. 2 foundry, basic and malleable is $45, Ironton, for this year and anywhere from $42 to $43 for next year. The Virginia furnaces have also raised their prices. Very little iron from that source has been disposed of in this vicinity. The Jackson county furnace strike has been settled and the three stacks have resumed. The men were granted the increase asked for but yielded as to the recognition of the union. The Star Furnace has been banked for repairs.

Keep Tab on Ferro Supply

Alloy Committee to Compile Monthly Statistics of Stocks and Production—Sales of English Spiegel Closed

New York, June 12.—In order to keep careful check on the supply of ferromanganese in this country, the subcommittee on alloys has arranged to collect monthly statistics. Blanks will be furnished to all consumers, to be filled out with the amount on hand at the beginning of the preceding month, and the tonnages consumed and received during the month. Domestic producers each month also will be asked to record their output. This statistical information is to be compiled each month as soon as possible, as long as the war lasts.

Active business in lots ranging up to several hundred tons each marked the ferromangenese market during the week. Most of these went at $400 to $425, delivered for last quarter, and $375 to $400 for first quarter and some tonnages for last quarter and first quarter together went at $390 to $400, delivered. Prompt carloads were sold averaging $450, delivered. Domestic metal figured in all these sales. No sales of English ferromanganese have been made for some time. Licenses for an additional 500 to 1000 tons have been granted so that June exports should be at least 5000 tons.

Demand for spiegeleisen has been active due in large measure to the efforts of the subcommittee on alloys to encourage the use of this metal on a larger scale as a substitute for ferromanganese. The most important single transaction was the purchase by a Pittsburgh district consumer of 5000 to 6000 tons of English spiegeleisen for delivery over the next four or five months. This metal, shipment of which is assured, went at a price equivalent to about $80, tidewater. The company which took this tonnage under normal conditions would have used ferromanganese. Further tonnages of English spiegeleisen are to be had, but it is understood that after the present offerings have been disposed of, no more of this metal will be available for some time. Sales of 3000 to 5000 tons of domestic spiegeleisen also have been made for late this year and early 1918. Domestic spiegeleisen is from $80 to $82.50, furnace, for this year and around $75 to $80 for first quarter.

Several carloads of 50 per cent ferrosilicon have been sold for June and July shipment at $250, delivered. This figure represents the market for June and third quarter. Some fourth quarter sales has been done at $175, delivered, and for first half have been made at less than $150, delivered.

Bessemer Ferrosilicon Up

Pittsburgh, June 12.—Lower grades of bessemer ferrosilicon are quoted at about $5 a ton above published prices, although no new sales have been made recently in the open market. Fifty per cent ferrosilicon has commanded $260, Pittsburgh, for delivery this year. The market for 80 per cent ferromanganese is not well defined. No large tonnages have been sold recently in this district.

Chicago Ferro Stronger

Chicago, June 12.—Ferromanganese from the local maker is being quoted

(*For miscellaneous prices see page* 1319.)

now at $450 for prompt and last half. A few small sales have been made for delivery early in 1918.

Quotations on spiegeleisen from eastern stacks for delivery during fourth quarter and first quarter have been $78 to $85, furnace for 18 to 22 per cent, and $275, furnace, for 38 to 42 per cent. Practically all spiegel used in this territory comes from the eastern manufacturing district, where an unusually large demand exists.

Closing for Shell Steel

About 80,000 Tons to be Distributed—Cleveland and New York State Plants Want 25,000 and 14,000 Tons

Pittsburgh, June 12.—With the government figuring in the market much more extensively than generally understood, the situation in semifinished steel is becoming extremely excited and rather uncertain. Special committees of the American Iron and Steel Institute shortly will distribute about 80,000 tons for forgings. It is reported unofficially that the American Can Co., the S. A. Wood Mfg. Co., the Eddystone Munitions Co., the Bartlett Hayward Co., the Smythington Machine Corporation and the Westfield Mfg. Co., have been awarded contracts for shrapnel rounds, each involving from 1000 to 10,000 tons of steel. Managers of mills who will be called upon to furnish this material have not yet received definite instructions about contracts.

Billets have registered a clean-cut advance of $5 a ton, and now are quoted at $95, mill. Sheet bars are held at $100, mill, and above. Muck bar has advanced $10, to a minimum of $80, Pittsburgh. Wire rods are held at $90 to $95, Pittsburgh.

Will Remelt Shell Discards

Philadelphia, June 11.—A development attendant upon the present high prices for steel scrap is the withdrawal of quotations on about 2000 tons of open-hearth shell discards by a western maker who has decided to remelt the stock. Sales of semifinished steel during the week include several thousand tons of open-hearth rerolling billets at slightly less than $90, Pittsburgh, of several hundred tons of shell discards at $48, Pittsburgh, and some small lots of forging billets at $115, eastern Pennsylvania.

Car Building Material in Demand

Buffalo, June 12.—The I. H. Symington Co., Rochester, has inquired for 14,000 tons of 3¼-inch rounds, to be used in the manufacture of government munitions. It is understood the order has not been booked as yet. There also is an inquiry for 20,000 tons of car-building material said to be for Russian and French cars.

Want Shell Steel Tonnage

Cleveland, June 12.—An inquiry for 25,000 tons of rounds has been put out by the Hydraulic Pressed Steel Co., Cleveland, to cover the steel requirements of a contract for 3,000,000 three-inch shell forgings received from the government. If the company is not able to buy this steel direct, it is expected that under the system now in vogue, it will receive this material through the American Iron and Steel Institute committee. Semi-finished prices are rising steadily. A local plate mill was quoted $102 Cleveland on an irregular assortment of odds and ends of slabs. Several hundred tons of ordinary forging billets were sold in this territory recently at $135 mill. Some makers of sheet bars continue to hold for $110 mill as a minimum and probably would quote more. There is but little inquiry for this class of semi-finished product.

More Ship Plates Wanted

Chicago Orders Increased to 45,000 Tons—Makers Await Big Program—Eastern Mills Contracting

Chicago, June 11.—Demand for steel plates has been intensified by government necessities for shipbuilding purposes. The leading interest has booked about 45,000 tons of plates for 14 ships to be built by the Skinner & Eddy Corp. and the Los Angeles Shipbuilding & Dry Dock Co. This tonnage is larger than was estimated when the order was first placed. The leading independent has taken about 500 tons of steel plates for tanks and other work in connection with various western army posts. Offers have been made of 8.50c for any delivery during 1917 and 9c for delivery in 30 days.

Tank Plates Sold for Export

New York, June 12.—Sales of tank plates in this district during the past few days include several lots of several hundred tons each at 10c, Pittsburgh, and one lot of 3000 tons at 10.50c, Pittsburgh, all for domestic consumption. It is understood that one lot of 10,000 tons has been closed at 10c for export. A growing percentage of the plate inquiry in this district of late has come from boiler manufacturers who are receiving contracts for government vessels.

Contract Tonnages Closed

Philadelphia, June 11.—Eastern Pennsylvania plate mills to some extent have let down the bars to contract buying, with the result that many tonnages have been placed during the past week for specification over the third quarter. This is as far ahead as the mill will accept such commitments at this time. Such contracts have been accepted only from regular customers, and most of this business came from railroads and locomotive builders, as well as shipyards. Many thousands of tons again were refused during the week. On business taken, nothing less than 10.159c, Philadelphia, appears to have been quoted on tank plates and 12.659c, Philadelphia, on Lloyd's boat steel. An attractive order for Lloyd's boiler steel was placed at 15c, base, mill.

Market Difficult to Follow

Pittsburgh, June 12.—The decision of the emergency fleet corporation to construct steel instead of wooden ships intensifies considerably the situation in steel plates. Several of the larger manufacturers have indicated that they will be able to furnish 2,000,000 tons of ship steel in 18 months. Numerous inquiries for shipyard structural material have come out; many of these, however, are vague and indefinite. Reports to the effect that Terry & Tench have taken contracts for 20 steel ships to be built at Savannah, Ga., apparently are incorrect, since the price at which this contract was placed, $400,000 per ship, leads to the belief that wooden vessels are involved. Quantities of tank plates for domestic purposes have been sold at 9c and above this week. A domestic consumer several days ago bought 3000 tons of material at 9c for rather early delivery.

Will Convert Tonnage

Cleveland, June 12.—A plate mill in the valley which recently resumed operations will convert tonnage of slabs under special arrangements with the owner of the steel. Cleveland makers are asking 10.50c mill on light plates but have little to offer. Some indirect war business recently received have been for watering troughs for horses. An eastern mill this week quoted 10.50c mill for plates for July delivery.

(*For miscellaneous prices see page* 1319.)

Expect Big Bar Orders

Institute Committee About to Distribute Tonnages—Place 10,000 Tons for War Wagons—Hard Bars Strengthen

Pittsburgh, June 12.—Special committees of the American Iron and Steel Institute this week will distribute heavy tonnages among barmakers for the manufacture of rounds for ammunition. Requirements of the government are extremely heavy, but not much information has been given out about material wanted for military purposes. Bar steel is quoted at as high as 4c; bar iron is listed at 4.25c.

Hard Bars are Stronger

Chicago, June 11.—Hard steel bars rerolled from rails are now quoted at 4c, Chicago mill, the former minimum of 3.75c, Chicago, having disappeared. Reinforced concrete demand is not up to expectations, but manufacturers, especially agricultural implement makers, are seeking unusual tonnages, which makes up for lack of reinforcing bar demand.

Soft Steel Bars Scarce

Chicago, June 11.—With the leading interest and the leading independent definitely out of the market except for government requirements, and almost every independent unable to book further contracts, soft steel bars are almost impossible to obtain except an occasional small tonnage. Prices are uncertain, but for such prompt material as can be obtained 4.94c to 5.19c, Chicago mill, has been done.

Close Steel For Trailers

Cleveland, June 12.—About 10,000 tons of tire and miscellaneous bar steel for the approximately 34,000 escort wagons for the army recently placed has been distributed with the mills. Reinforcing bars are considerably stronger owing to the great scarcity of rerolling rails for which the mills recently have paid $50 a ton. For spot shipment, 3.50c mill and for deferred shipment 3.75c mill is being quoted. Some inquiries for angles for rigging for mine sweepers to be manufactured in this territory have been put out. Bar iron producers who recently quoting $4.25c, mill, have withdrawn from the market.

Bar Iron Inquiry Heavy

Chicago, June 11.—Inquiry for bar iron is heavy, for private and for government purposes. Considerable tonnage is being required by vehiclemakers for the construction of army wagons and automobile body builders also are seeking tonnage. The price is 4c, Chicago mill, all lower quotations having been eliminated.

Government Distributes Shafting

Pittsburgh, June 12.—Demands of the nation have become so heavy that one independent manufacturer of cold rolled steel shafting has opened offices at Washington, in order to offer efficient service. Shafting is being held generally at 5 per cent off to list, although some material continues to be obtained at 10 per cent and 15 per cent off on old quotations.

Rivets Wanted for Ships

Pittsburgh, June 12.—Orders for approximately 40,000 tons of ship rivets will be distributed this week among the comparatively few concerns equipped to handle this work. Quotations have been advanced $5 to 5c and 5.10c, respectively, for structural and boiler rivets.

Hoops Jump Sharply

Pittsburgh, June 12. — Mills having surplus tonnage to offer are selling bands at 6c and hoops at 6.25c for delivery within the next 60 or 90 days. These products nominally are quoted at prices $20 a ton under those figures.

Close Sheets for Camps

Four Lots of 1000 Tons Each Placed for Stores—War Orders at Chicago and in East

Cleveland, June 13.—Orders are reported to have been placed with four mills in the valleys and Pittsburgh district for 1000 tons each of black sheets for stoves for army camps and for delivery as soon as possible. It is believed that close to a 10 per cent concession in price was made to the fabricator who submitted a government certificate with his inquiry. Black sheets are quoted in the valley at 8.50c to 9c, bessemer.

Place War Orders in East

Philadelphia, June 11.—Placing of tonnages for war requirements continues the principal activity of the sheet market. Orders of this character recently taken include lots running up to over 1000 tons each of sheets for conversion into torpedo cases, cartridge cases, marking buoys for harbor nets, tanks for submarine chasers, powder cases, cups and pans and other camp utensils. An inquiry for 7500 tons of sheets for camp stoves is still pending. The market for No. 10 blue annealed still is 8c. Sales of black sheets for shipment in a few weeks have been made at 8c, Pittsburgh base.

Few Makers are Selling

Pittsburgh, June 12.—Not more than four or five sheetmakers in western Pennsylvania, eastern Ohio and West Virginia are figuring in the market and they are offering only limited tonnages at high prices. Mill capacities have been mobilized to serve the government, which is taking surplus stocks ordinarily available for nearby shipments. The subcommittee on sheets is distributing orders for the manufacture of such military necessities as camp ranges, buoys, helmets, shell cases and the like. Prices continue to advance sharply. Black sheets have commanded as high as 9c for No. 28 gage; a consumer paid 8.50c a few days ago for 500 tons. The maximum price of blue annealed stock has advanced to 8.50c. Galvanized material now is quoted at 10c to 10.75c for No. 28 gage.

Awaiting Government Allotments

Youngstown, O., June 12. — Black sheets at 10c appear to be not far off. The government allotments are being worked out as fast as the sheet committee can make estimates and now are expected to be announced before the end of June. Allotments to the valley mills may take up their capacities for months.

Bessemer black sheets, No. 28 gage, are quoted in the valley today at 8.50c to 9c; blue annealed, No. 10 gage, 8.25c to 8.50c; galvanized, No. 28 gage, 10.25c to 10.75c. Open-hearth sheets are from $5 to $10 higher. Sheets of all grades are scarcer than ever. Most of the odd lots of various mills have been disposed of.

Prices Soar at Chicago

Chicago, June 11.—Government requirements for steel sheets are beginning to present themselves and a Chicago sheetmaker recently took 700 tons to be used in the manufacture of camp stoves and other material for army posts. Prices have advanced sharply and No. 28 gage black are now quoted at 8.44c to 8.69c, Chicago; No. 10 gage blue annealed at 8.19c to 8.69c, Chicago; and No. 28 gage galvanized at 10.19c to 10.69c, Chicago.

(For miscellaneous prices see page 1319.)

Ship Yard Demand Heavy

Large Contracts for Fabricated Work Placed by Navy and Private Yards—9300 Tons at Newport News

New York, June 12.—Interest in the shape market continues to be concentrated chiefly in the structural requirements of government navy yards and private ship building plants. The largest letting of the week is one of 9300 tons to the McClintic-Marshall Co. for two crane runways and two buildings to be added to the plant of the Newport News Shipbuilding & Dry Dock Co. Bids have been opened on 3000 tons for a foundry for the League Island navy yard and on 800 tons for a machine shop extension. The American Bridge Co. has taken 3000 tons of shapes for a structural shop at the Brooklyn navy yard. The general contract for an erecting shop and other structures at the Watertown arsenal has been let to Norcross Bros., who are taking bids on approximately 1000 tons of steel for this work. It is expected that announcement will be made shortly on the extent to which fabricators will participate in the government shipbuilding program.

Mill Tonnage Maintained

Philadelphia, June 11.—While demand for the general run of new building work shows a decrease, needs of structural steel for government buildings of all kinds, for car and locomotive construction and for miscellaneous purposes is of larger proportions than ever. Specifications against contracts and new tonnages which have to be taken on, prevent any shrinkage in mill bookings. As much business is being turned away as in recent months. The minimum price for shipment at mill's convenience continues 4.25c, Pittsburgh, although one mill has a minimum of 4.50c, and another a minimum of 6c. Minimum on ship shapes now is 6c, Pittsburgh. Large export tonnages continue to be offered without finding takers. On one lot of plain shapes for export 6c and on ship shapes 8c was offered.

Makers Wait War Orders

Pittsburgh, June 12.—Fabricators will be called upon shortly for tremendous tonnages of material for the erection of shipyards and the building of ships. Nothing definite has been done with reference to the construction of vessels under the direction of the government. Domestic building projects have been deferred in all sections of the country, and it generally is believed that the structural situation will continue quiet until demands of the nation become more clearly defined. Quotations on structural material are regarded as nominal.

Fabricator Resells Material

Chicago, June 11.—Some insight into the structural steel conditions was given recently when 2000 tons of plain material were resold at 5.34c, Chicago, by a fabricator who preferred his profit in this way.

New structural projects are few in the west, the largest placed recently involving 419 tons for an armory at Purdue University. One project still pending is about 500 tons for a 14-story building for the Deseret National Bank at Salt Lake City.

CONTRACTS AWARDED.

Edgewater exchange building for the Cleveland Telephone Co., 150 tons to the National Iron & Wire Co.

Power house, League island navy yard, Philadelphia 2000 tons, general contract to Warren & Moore.

New armory for Purdue University, LaFayette, Ind., 419 tons, to Central States Bridge Company.

Additions and alterations to boiler shop M-6 for the Chicago & Northwestern Railway Co., 310 tons, to A. Bolter's Sons Co.

Portable standard unit steel buildings for government, 320 tons, to Milliken Bros.

Buildings for Braden Copper Co., Chile, 400 tons, to Milliken Bros.

Crane runways and buildings for Newport News Shipbuilding & Dry Dock Co., Newport News, Va., 9300 tons, to McClintic-Marshall Co.

Mill buildings for Baltimore Tube Co., 900 tons, to American Bridge Co.

Buildings for State hospital for insane, Byberry, Pa., 675 tons, to McClintic-Marshall Company.

Pullman Co., Buffalo, extension to car shops, 600 tons structural, contract to Buffalo Structural Steel Co.

Structural shop, Brooklyn navy yard, 3000 tons, to American Bridge Co.

CONTRACTS PENDING.

Desert National Bank building, Salt Lake City, 500 tons. Bids being taken.

Bridges for Pennsylvania railroad, 450 tons, bids being taken.

Double track on Virginian railroad, 700 tons, revised bids being taken.

Machine shop extension at Brooklyn navy yard, 800 tons, bids being taken.

Buildings for naval ammunition depot at St. Julians Creek, Va., 150 tons, general contract, to Roche Construction Co.

Buildings for Watertown arsenal, 800 to 1000 tons, general contract to Norcross Bros.

Machine shop extensions, Brooklyn navy yard, 800 tons, Post & McCord, low bidders.

Small buildings at various points for navy department, 2000 tons, bids due June 18.

Study War Car Order Plan

Government's Proposed Purchase of 100,000 Cars Will Involve 500,000 to 1,500,000 Tons—Shops Can Handle Business

Chicago, June 11.—Principal interest in the steel and car market centers in the proposed purchase by the United States government of 100,000 freight cars to relieve the general situation. This would involve from 500,000 to 1,500,000 tons of steel, as requirements vary from 5 to 15 tons per car, according to type.

The Pennsylvania railroad has decided to build 1000 all-steel box cars at its Altoona shops, which will care for half its recent inquiry. The Navy department has ordered two flat cars from the Mt. Vernon Car Mfg. Co. for artillery purposes. The New York Central railroad has withdrawn its inquiry for 1000 gondolas.

Russia Places More Orders

New York, June 12.—The American Locomotive Co. has taken a contract for 68 locomotives for the Russian government. These are in addition to the 250 recently booked. The American Locomotive Co. also has taken 25 locomotives for the Southern railway and 20 for the South African railways. The Baldwin Locomotive Works has booked orders for five miscellaneous locomotives. The Pennsylvania railroad, which recently ordered 245 locomotives, has placed orders for an additional 23.

The Norfolk Southern railroad is in the market for 1500 kegs of spikes.

Spikes Advance Sharply

Pittsburgh, June 12.—Standard railroad spikes have been advanced about $10 a ton to 4.50c. One-half, $\frac{7}{8}$ and $\frac{3}{4}$-inch spikes are held at 5c and $\frac{7}{8}$-inch, 5.50c to 6c. Demand is heavy.

Seek Rails in Canada

Toronto, June 12.—The imperial munitions board has authorized the Algoma Steel Corporation to roll 50,000 tons of standard rails for the Canadian Pacific, Intercolonial, Grand Trunk and Finniskanning & Northern Ontario Railway companies to replace the rails that were given up for export to the European war zone. American railroads are seeking to place orders with the Algoma corporation for delivery late in 1918 and early in 1919, but only a few have been accepted.

(*For miscellaneous prices see page* 1319.)

Scrap Keeps Up Wild Rise

New Advances Range from $1 to $4 as Scarcity Becomes More Acute—Pittsburgh Demand Sways Market

Chicago, June 11.—Advancing quotations with a general shortage of all and an acute scarcity of many grades, characterizes the iron and steel scrap market in Chicago. Quotations which had long since passed the bounds of imagination, continue to go forward in leaps of $1 to $3 per week. Consumers generally are taking their usual tonnages, while comparatively little scrap is going out from usual sources. The leading independent steelmaker is in the market for a round tonnage and it is believed it will take from 10,000 to 20,000 tons. Rerolling rails are now quoted at $45 to $45.50. A recent sale of about 2000 tons was made at $46. On a small tonnage of unusually attractive material, $52 is said to have been paid. On some shoveling steel a steelmaker recently paid $36. No. 1 busheling has almost disappeared from this market as it is being mixed with shoveling steel. Plants dependent upon busheling have great difficulty in obtaining supplies. Railroads have more tonnage pending than has been the case recently. The Missouri Pacific railroad offers 3500 tons, the Santa Fe railroad 2770 tons, the Union Pacific railroad 1250 tons, the Mobile & Ohio railroad 900 tons, the Chicago, St. Paul, Minneapolis & Omaha railroad 800 tons, the Chicago & Eastern Illinois railroad 700 tons and the Soo Line 100 tons.

Rapid Rise Holds in East

Philadelphia, June 11.—The sensational buying of heavy melting steel in the Pittsburgh district continues the dominating factor in the iron and steel scrap market here. Pittsburgh dealers have offered to take any amount of steel scrap available and have bid as high as $37 and $37.50, delivered Pittsburgh, equivalent to around $35, deliverd eastern Pennsylvania. Large tonnages have been sold to Pittsburgh interests during the week but now it is difficult to place additional orders. Although there has been no local buying of steel, this grade now is quoted at $30.50 to $31.50, delivered eastern Pennsylvania. Local dealers are buying everything to be had at this level. Two eastern mills which inquired recently and another eastern consumer who purchased large blocks of pig iron are expected to be large buyers of heavy steel shortly. All other grades are in active demand from eastern consumers. This is particularly true of wrought scrap. Prices generally have advanced from 50 cents to $4 per ton.

Producers Holding Out

Cleveland, June 11.—Cleveland scrap producers are believed to be holding out for still higher prices. Many of them, however, are expected to release their holdings soon, in view of the profits to be realized at present prices. Some traders thinking of the eventual breaking point are counselling caution. The rising market at Pittsburgh is being felt in Cleveland though less perhaps than in other districts. A fair amount of scrap has been quietly bought by Pittsburgh consumers. Prices show sharp advances in all lines. Heavy melting steel is quoted at $37 to $38 and it is believed that slightly higher than this figure has been done. There is talk of $40. For plate scrap $41 has been offered to local mills. A small lot of steel angles was sold by the city at $60, 50 tons of old tires, short lengths and broken transformer casings at $31.25, and a minor quantity of miscellaneous cast iron and steel scrap at $24.

Some Grades Up $6

Cincinnati, June 11.—All kinds of iron and steel scrap have taken on sudden advances. Some grades are fully $6 a ton above the quoted prices on June 1. Local dealers predict further advances before the end of the present month. The demand from the rolling mills was never heavier. Wrought scrap has been marked up higher than cast. Steel rails for rerolling are in urgent demand, as are relaying rails. Borings and turnings are also wanted by different melters. Taking everything into consideration, the present market is stronger than it has been for a number of years. All scrap prices are higher than they were the first part of 1907.

Big Outward Movement

St. Louis, June 8.—The market for scrap iron and steel at this center daily grows more excited and irregular. Price changes all are radically upward, and the predictions of still higher levels are being made by best posted buyers and sellers. This opinion is based on scant supplies, an urgent demand from all quarters, and the unprecedented conditions prevailing generally. The most notable feature in the market during the past week was the heavy demand from other centers. Heavy shipments were made to the Pittsburgh district, an almost unheard of thing, and heavy consignments also were made to the Colorado Fuel & Iron Co. One dealer shipped to a foundry near Pittsburgh. The drawing of this material from an already stringent supply has alarmed consumers and dealers, and in instances has resulted in a stampede to purchase. A wide spread in quotations is common. As a general rule, though, consumers do not hesitate to pay top market prices for any material offered. Country and general offerings continue light, and the same is true of railroad lists. The latter, however, were somewhat heavier than recently and include: Big Four, 3200 tons; Kansas City & Southern, 300 tons; Toledo, St. Louis & Western, 200 tons, and a smal list from the Frisco railroad.

Record Advances at Buffalo

Buffalo, June 12.—Record advances in scrap prices have taken place in the Buffalo territory. Heavy melting steel has advanced $9 a ton; wrought pipe $10, and low phosphorus scrap, $4 to $7. Carwheels have gone to $31 to $32. Nothing like the present upward bound of old material prices has been recorded at any previous time in the history of the local market. Dealers in the face of car shortages and scarcity of labor are being overwhelmed with a demand for their diminishing supplies. Some of the mills are unable to get normal quotas of scrap as government requirements have taken precedence over ordinary shipments, further restricting the movement from the yards and also preventing dealers from assembling and sending out their customary tonnage. There are cases where drastic steps are being taken to compel deliveries on old contracts in the belief tonnages are being held back for higher prices.

Southern Market is Higher

Birmingham, Ala., June 12.—Further advances have been established in iron and steel scrap in the south during the past week. A general scarcity is reported and consumption is heavy. The recession predicted a few weeks ago is not in sight. New prices included old steel rails up to $25 and 26, heavy melting steel to $20 and $21, No. 1 wrought to $30 and $31, No. 1 machinery to $25 and $26, car wheels and tram car wheels to $22.50 and $23.50. Scrap dealers are working hard to accumulate some

(*For miscellaneous prices see page* 1319.)

stock. They are obliged to decline business offered in various grades.

Metropolitan Market Excited

New York, June 12.—The iron and steel scrap market has been greatly excited during the week and prices are $1 to $5 per ton higher on the average. Demand not only has come in large volume from consumers, but dealers generally have been eagerly combing the market for all grades to cover previous commitments. At present, there is a lull since sellers are shy about taking on further bookings. Demand on the other hand shows no let up. All grades are scarce, notably steel and wrought. Steel axles have been sold as high as $55, New York, and railroad wrought at slightly over $50. The most spectacular business was in heavy melting steel for Pittsburgh buyers. As high as $38, delivered Pittsburgh, has been paid for No. 1 steel. Pittsburgh interests continue to bid freely, but now find it difficult to get tonnage. Buying by eastern consumers has involved principally wrought. City wrought has been sold over $28 for short and over $36 for long stock. For wrought pipe, $26 to $27 has been paid freely. Demand for foundry scrap is brisk.

Car Shortage Checks Sales

Pittsburgh, June 12.—Iron and steel scrap continues to vie with pig iron in commanding the attention of the trade. Heavy melting steel, purchased at $35, delivered, by the Carnegie Steel Co. last week, has advanced to $40 and talk of $50 stock is heard. The Carnegie company withdrew from the market after buying approximately 50,000 tons of heavy melting stock, turnings and borings. A scarcity of scrap is developing, as a result of the shortage of cars. The Baltimore & Ohio railroad, after asking bids on about 20,000 tons a week ago, disposed of only a small amount of its stock, not being able to move material freely. Quotations have advanced from $2 to $10 a ton all along the line. Billet and bloom crops commanded above $50 and rerolling rails are being held at $49 a ton by sellers in this district. Machine shop turnings and borings have been sold at $20 a ton and above.

Aim for More Coke Supply

Committee Named to Secure More Equitable Car Distribution —Spot Furnace Up to $11—No Contracting

Pittsburgh, June 12.—In an effort to increase shipments of Connellsville coke, F. S. Peabody, chairman of the committee on coal production of the national defense council, has created a sub-committee on coke for blast furnaces, the chairman of which is E. L. Pierce, president, the Solvay Process Co. Associated with Mr. Pierce, are representatives of retort and beehive oven coke producers. The commission on car service, the coke committee, C. D. Dyer, vice president Shenango Furnace Co., representing the committee on iron ore, pig iron and lake transportation, and C. L. Doyle, traffic commissioner, the American Pig Iron association, met at Washington last week to determine to what extent the shortage of Connellsville coke has contributed to the shortage of pig iron, which has been developing rapidly. It developed that by-product coke oven plants are running about normal. It was apparent that blast furnaces must look to beehive ovens for relief. Many coke cars have been forced into the lake ore and coal traffic aggravating the behive coke shortage. Efforts are being made to have available open top cars placed in the transportation of the different materials for the manufacture of pig iron and to avoid inadvertent discrimination in favor of iron ore. It is estimated that the car supply in the Connellsville regions should be 75 or 80 per cent to meet requirements. It was 59 per cent last week, compared with 58 per cent the week before. Quotations continue to advance. Spot blast furnace coke is selling at $10.50 to $11 and spot foundry is bringing $11.50 to $12. Production of coke the week ending June 2 was 345,720 tons, compared with 344,625 tons the week before, according to *The Connellsville Courier*.

Little Free Fuel in South

Birmingham, Ala., June 12.—Indications point to little coke being left for contract since renewals and orders placed some time ago require about as much as can be produced. The same prices that have ruled for some time remain in effect. These are $6 to $8 for furnace and $10 to $12.50 for foundry coke. Alabama production is the greatest in history.

Buy Foundry for 1919

Philadelphia, June 11. — An unusual transaction is the purchase by an eastern consumer of foundry coke requirements as far ahead as the first half of 1919. This business went at $10, Connellsville, for last half of 1917, $9.75 for first half of 1918, $9.50 for last half of 1918, and $9.25 for first half of 1919. Quotations on foundry coke have advanced materially. Spot cars have been sold at $11 and $11.25, Connellsville. Foundry coke for last half has been sold at $10 and for first half at $9.50, Connellsville. Quotations asked on these positions today are $10.50 and $10, respectively.

Deliveries Fall Far Back

St. Louis, June 11.—A further stiffening in coke prices has appeared, due to a marked scarcity of fuel, good general demand and a growing shortage of cars. Reports from ovens which supply the bulk of tonnage to this district are to the effect that it is impossible to get empty cars, and that the situation in this respect is getting worse.

Deliveries on contract fell off more than 50 per cent during the first 10 days of June, and many consumers are being hard pushed to maintain activities. Brokers and dealers have virtually nothing to offer. A few cars were sold this week at the highest figures to date. These fancy prices, however, are hardly a gage of the market. Connellsville and Virginia 72-hour foundry coke is quoted from $13.80 to $14.80, St. Louis or East St. Louis, for June delivery.

Foundry Bars at $11.50

New York, June 12.—Predicted higher prices on coke are materializing rapidly. A considerable tonnage of standard Connellsville foundry coke which last week could be had at $10.50, was sold yesterday in this district at $11.50, for last half and numerous other sales for the same position have been made since.

Future Supplies Scarce

Cincinnati, June 12.—Contract coke is becoming very scarce. The majority of the foundries have bought enough coke ahead to run them through the first half of next year. A few yearly contracts were also made. Furnace coke is at a standstill and producers and their selling agencies are straining every nerve to move shipments forward. Only a slight improvement is to be noted in the car situation, and as a consequence there are many complaints about delayed shipments. Connellsville foundry coke is quoted for nearby shipment from $9.50 to $11.50, ovens. Wise county foundry coke is unchanged at $10.50 to $11, while Pocahontas operators are quoting about the same figures. New river foundry coke is held around $12 to $12.50. Furnace coke in all four fields is quoted at from $9 to $10.50 per ton. No contracts have been made lately, and there is little future 48-hour coke that could be obtained with any degree of certainty that it would be delivered on time.

(*For miscellaneous prices see page* 1319.)

Pipe For Camps

Makes Up Principal Tonnage of Market—City Work Light

Chicago, June 11.—Were it not for expectations of substantial tonnages for use at various army posts the cast iron pipe business would be dead. Cities have practically withdrawn from the market and the government is not ready to buy until a further appropriation is provided. Cast pipe has been sold for some established army centers, Fort Benjamin Harrison taking 750 to 1000 tons, Ft. Riley, 500 tons, and an aviation camp at Mt. Clemens, Mich., 50 tons. Supplies for camps in this territory will be needed for Tacoma, Rockford, Ft. Sheridan, Battle Creek and Chillicothe. Bids will be opened June 13 at Kansas City, Mo., on 3160 tons and at Hammond, Ind., June 20 on 100 tons.

Production Large in South

Cast iron pipe plants in the south are producing heavily. The United States Cast Iron Pipe & Foundry Co. has been able only recently to make inroads on the contract from the Argentine government as cars and other transportation facilities have not been available. This contract calls for 65,000 tons of pipe and it is expected it will require the better part of the year to complete the order.

Merchant Pipe Easier

Pittsburgh, June 12.—Restricted building operations in all sections of the country have relieved pressure considerably for smaller sizes of iron and steel pipe, but material continues to be sold at slightly above published quotations. Demand for oil country goods continues exceedingly heavy and deliveries show no improvement. Prospective builders of oil and gas lines have about given up attempting to buy additional tonnage for shipment this year. Outbound shipments are described as more satisfactory. One manufacturer, who had 50,000 tons of stock awaiting the arrival of cars or motive power a fortnight ago, now has not more than 10,000 tons in his yards.

Buying Picks Up

New York, June 12.—Buying of cast iron pipe during the past few days has been the most active in a month. Many lots have been placed by private buyers and a number of them inolved from 500 to 1000 tons each. Export inquiries have appeared for 4000 to 5000 tons. Municipal requirements are larger than at any time in weeks. New York City will open bids June 19 for 865 tons of 6 to 12-inch pipe; Boston, June 15 on 500 tons of 36-inch; Yonkers, N. Y., June 19 on 250 tons of 6 to 10-inch; and Hartford, Conn., June 15 on 250 tons of 4 to 16-inch. Prices are unchanged at $58.50, delivered New York, for 6-inch class B and $61.50 for 4-inch class B.

May Direct

Tonnage of Tin Plate to Needs of the Allies

Pittsburgh, June 12.—Despite numerous handicaps, caused by deferred deliveries of sheet bars and the like, tin platemakers in this and adjacent territory satisfactorily are meeting demands of perishable foodpackers in all sections of the country. It is likely that American tin platemakers will be able to divert large tonnages to our allies who are in need of tremendous quantities of containers.

The Baxter Stove Co., Mansfield, O., has announced its retirement from business.

May Steel Output Up—Iron and Ore Drop

STEEL-PRODUCING furnaces are maintaining a higher rate of output than blast furnaces. THE IRON TRADE REVIEW is enabled to make this statement, owing to the co-operation of most of the iron and steel manufacturers in furnishing their production records. The pig iron figures given below are complete and official with the exception of the records of three companies: Pittsburgh Steel Co., Kelly Nail & Iron Co., and Red River Furnace Co. All other companies furnish their figures, thus giving accurate returns from 421 out of 425 blast furnaces. The figures for the companies not reporting is estimated. The steel figures include reports from a large majority of the independent steel producers.

Steel production so far this year by these latter companies is as follows:

STEEL INGOT OUTPUT
Figures Furnished by Same Companies

	January	February	March
Basic and O. H.	877,634	774,815	948,157
Bessemer	190,683	172,764	200,492
Electric	5,326	4,864	6,662
Totals	1,073,643	952,443	1,155,311

	April	May
Basic and acid open hearth	901,246	994,951
Bessemer	172,394	201,461
Electric	6,489	6,578
Totals	1,080,129	1,202,990

The May steel production was thus greater than in any previous month this year. The gain over March and January, months of equal length, was 47,679 tons and 129,347 tons, respectively. Open-hearth steel production, of course, accounted for the bulk of the gain, the increase over March being 46,794 tons and over January 117,317 tons.

Pig iron production, except in April, has lagged behind the steel output. The following table shows concisely the year's steel and pig iron production history:

STEEL INGOT OUTPUT

	Total	Daily average	Relative production Jan. = 100 per cent
Jan.	1,073,643	34,634	100.00
Feb.	952,443	34,016	98.22
Mar.	1,155,311	37,268	107.61
Apr.	1,080,129	36,004	103.96
May	1,202,990	38,806	112.04

PIG IRON OUTPUT
Figures Complete for Country Except Three Companies Whose Output is Estimated.

	Total	Daily average	Relative production, Jan. = 100 per cent
Jan.	3,159,839	101,930	100.00
Feb.	2,649,935	94,641	92.85
Mar.	3,255,813	105,026	103.04
Apr.	3,319,809	110,936	108.84
May	3,413,677	110,119	108.03

The last column above in which the January rate of production is taken as 100 per cent, gives a clear insight into the relative degree of gain or loss made by the steel furnaces and blast furnaces in each month. Steel output in May gained 12 per cent over January while pig iron output gained only 8 per cent.

Comparing May and April, the steel furnaces showed an increased output last month of 7.78 per cent. The blast furnaces, however, fell a little below their April record, the decrease amounting to 0.0074 per cent.

The May shipments of iron ore from the Lake Superior district lagged behind last year's record, dropping from 8,449,580 tons in May, 1916, to 6,283,612 tons last month. The decline of 2,165,968 tons amounts to 25.63 per cent. Ore shipments so far this season total 6,495,144 tons against 10,107,991 tons in the same period last year. The decline of 3,612,847 tons is equal to 35.74 per cent, a proportion that will fall steadily, of course, as the season continues.

Shipments of 55,000,000 to 56,000,000 tons of ore are needed this year to supply blast furnace demands to June 1, 1918. Last year the lake fleet noved 64,734,198 tons. The lake fleet is now operating near capacity and will be able to approximate last year's record from now on. The ore movement also will be aided by the newly organized clearing committee which will meet daily and provide against delays to vessels or railroad cars.

(*For miscellaneous prices see page* 1319.)

All Must Help

To Make Traffic Facilities Adequate, Says Howard Elliott

Howard Elliott, former president of the New York, New Haven & Hartford railroad and now a member of the railroads' war board, has issued a statement outlining the efforts of the war board in arranging for the movement of the essentials of life. "The war board feels," Mr. Elliott said, "that if the war goes on, the total amount of transportation now available will not be enough. It is going to be great deal more important for this country to move food, fuel, iron and similar necessities than to move luxuries. The railroads have done their best in the last 18 months to add to their cars and engines. There have been placed in service since Nov. 1, 1916, 989 engines and 44,063 new cars. Orders have been given for, as of April 1, 2209 engines and 104,917 cars. We hope they will be received between now and Jan. 1, 1918. If so, there will have been introduced into the service between Nov. 1, 1916, and Jan. 1, 1918, 148,980 cars with an average capacity of over 50 tons; and 3188 engines, with an average tractive power of 54,000 pounds, which is very much above the average of the engines of the United States.

"On May 1 there was, according to the record, a 'shortage' of 150,000 cars. In round numbers there are 2,500,000 cars in the United States. If, through better loading by the shipper, better unloading by the consignee, better movement by the railroad, and more alert work by every man in the railroads, from the president down to the waterboy, each car is used efficiently, it will not take long to get what amounts to an added service of 150,000 cars out of the cars on hand.

"The railroad war board has supplied to the government five trained railroad officers, who were commissioned to go to Russia to help the Trans-Siberian railroad to move toward the Russian front the freight piled up at Vladivostok. We are arranging to obtain nine regiments of trained railway officers and employes to help the English and French people carry on railroad activities, principally in France."

Manufacturers Honored by Engineers

Samuel T. Wellman, president, Wellman-Seaver-Morgan Co., and Ambrose Swasey, president, the Warner & Swasey Co., were made honorary members of the Cleveland Engineering society at the thirty-seventh annual banquet at the Hollenden hotel, Cleveland, June 12. Mr. Wellman, who was not able to attend the banquet, wrote a letter to the society tracing the early history of steel mill equipment. In a short address, Mr. Swasey emphasized the growing importance of the work of engineers and referred to evidences of engineering activity witnessed in the Orient.

The retiring president, F. W. Ballard, announced that the American Society of Civil Engineers has given in trust to the Cleveland Engineering society 22,000 volumes for its library. J. H. Herron, consulting engineer, was installed as president of the society. G. Douglas Wardrop, editor of *The Aerial Age*, gave an illustrated lecture on "The War in the Air". Mr. Wardrop vividly described the activities of the airmen in France, and surprised his listeners when he outlined the tremendous program of aerial warfare contemplated by the United States.

Schwab Believes Highest Output Not Attained

Prediction that the steel output of the United States is far from its zenith today, was made by Charles M. Schwab, speaking before the annual meeting of the World's Congress of Salesmanship, Detroit, June 11. His topic was "Super-Salesmanship". He said, in part: "The opportunity for the salesman in that new world which will confront us at the close of the war will be one of the great openings of all history. Up to now we have been largely concerned with our domestic problems both in politics and in business. The end of the war will find us engaged in world politics, in international trade, and in world affairs on the largest possible scale.

"We should prepare to carry American methods and American ideals to all parts of the world to build and to develop. This war is going to result in the world moving forward in a few years as much as ordinarily would require centuries. Of this vast expansion of world effort and energy I predict that the steel business will form the basis just as it has been the basis of our own national development in the past 25 years.

"The United States produced 1,000,000 tons of steel in 1880; in 1916 some 40,000,000 tons were produced. The 1917 production will probably be 45,000,000 tons.

"When the United States Steel Corporation was formed, 15 years ago, the annual steel production of the country was only 12,000,000 tons and many believed we were then at the zenith of the steel business. My own belief is that we are just as far from the zenith today as we were in 1901."

(*For miscellaneous prices see page* 1319.)

Over One Hundred

Complete Ships and Hulls Awarded by Government to Date

Washington, June 12.—Announcement has been made by Maj. Gen. George W. Goethals, of the award of additional contracts for 46 wooden hulls. Of this number 10 went to Sanderson & Porter, 52 William street, New York, with works at Willapa Harbor. The first hull is to be delivered on April 1, 1918, and one hull every 15 days thereafter, ending Aug. 30. The remaining six hulls were awarded to the Maryland Ship Building Co., Lexington building, Baltimore, with works at Sollars Point, Md. The first hull is to be delivered on April 30, 1918, and one hull on the last day of each succeeding month, ending September 30.

The summary given out by General Goethals showing contracts up to date is as follows:

Complete steel ships	18
Complete composite ships	32
Complete wooden ships	30
Total complete ships	80
Wooden hulls	24
Total number ships and hulls contracted for	104
Total number contracts executed	12

New England Foundrymen Plan Traffic Body

J. H. Hamlin of the Whitin Machine Works, Whitinsvills, Mass., W. J. Breen of the W. J. Breen Co., Boston, and B. M. Shaw of the Walker-Pratt Mfg. Co., Watertown, Mass., who constitute the committee of the New England Foundrymen's association in charge of the question of keeping in touch with railroads and shippers regarding delays in shipments of material consigned to New England points, have recommended that the association organize a traffic department. The association, which maintains an office at 205 Broadway, Cambridgeport, Mass., now is communicating with foundrymen throughout New England in order that a traffic department may be organized and maintained while the present congestion in freight continues.

Institute Adds New Names to Membership List

A number of new names have been added to the waiting list of membership in the American Iron and Steel institute private directory. They are as follows:

F. E. Patterson, secretary and treasurer, American Steel Foundries, Chicago; Clarke P. Pond, sales manager, David Lupton's Sons Co., Philadelphia; John Malcolm Hart, president, John M. Hart Co., Chicago; Clifford Atwood Cowles Jr., chief engineer, Atlantic Steel Co., Atlanta, Ga.; Samuel Noble Roberts, assistant general superintendent, Atlantic Steel Co., Atlanta, Ga.; Frank W. Tickner,

general manager, Valley Mould & Iron Corporation, Sharpsville, Pa.; Rufus Eicher Zimmerman, assistant director research laboratory, American Sheet & Tin Plate Co., Pittsburgh; William T. Shepard, partner of Rogers, Brown & Co., Buffalo; Parker F. Wilson, assistant to president, the Otis Steel Co., Cleveland; Walter B. Enck, assistant to president, Donner Steel Co., Inc., Buffalo; Frank D. Hoerle, assistant general manager of sales, Donner Steel Co., Inc., Philadelphia; William I. Howland Jr., special agent, Carnegie and Illinois Steel Companies, Pittsburgh; Frederick Curtis Perkins, executive committee, Sharon Steel Hoop Co., Pittsburgh; Charles Armstrong Anderson Jr., district sales manager, Pittsburgh Valve, Foundry & Construction Co., Philadelphia; Henry Oliver, president, Oliver Iron & Steel Co., Pittsburgh; W. Vernon Phillips, Lansdowne, Pa., iron and steel merchant; Eli Joseph, Joseph Joseph & Bros. Co., New York; Joseph Michaels, Hyman Michaels, Chicago; Joseph Groves, president, New York Metal Exchange, New York; E. O'Connor Acker, Bethlehem Steel Corporation, S. Bethlehem, Pa.; John Lyman Cox, engineer, Midvale Steel Co., Philadelphia.

Much Ore Mined

From Great Northern Ore Properties During the Past Two Years.

In the past two years since the United States Steel Corporation surrendered the properties held under the famous Hill lease, these mines have produced 2,315,290 tons of iron ore. Shipments totaled 941,023 tons while the stockpile balance was 1,374,267 tons. The annual report of the trustees of the Great Northern Iron Ore Properties for 1916, which reveals this fact, shows also that mining operations were carried on last year at the Thorne, Leonard, Harold, South Uno, North Uno, Langdon & Warren, 40 and Alexandria mines. Stripping operations continued at the Hill-Annex mine, while the grading of the approaches to the proposed concentrator plant at Pinacle Lake was practically completed.

Among the more important transactions of the year was the signing of an agreement under which the Donner Mining Co. took over the Alexandria and St. Anthony No. 2 mines. The lease on the Leonard mine was extended for a period of 10 years, expiring Jan. 1, 1930. The underlying royalty was increased from 25 cents to 45 cents per ton. The Warren mine was leased to the Mead Iron Co. at a royalty of 15 per cent of the ore mined. The Smith mine was leased to Butler Bros. at a royalty of $1.10 per ton. A portion of the North Uno mine was leased to Butler Bros. at a royalty of $1.10 per ton. The Dunwoody mine was leased to the Orwell Iron Co. at a royalty of $1 per ton for ore mined from open pit and 70 cents per ton for ore mined underground.

Plan New Works in South

Steel Corporation Approves Expenditure of $11,000,000 of Tennessee Company at Fairfield—Will Meet War Needs

Birmingham, Ala., June 12.—An expenditure of $11,000,000 for extensions of the Tennessee Coal, Iron & Railroad Co. at Fairfield, Ala., has been recommended by the finance committee of the Steel Corporation, and work is to be begun vigorously on these enlargements in the near future. An announcement to this effect was made by Chairman E. H. Gary following a two-day tour of inspection, June 8 and 9, of the work of the Tennessee company by himself and other members of the financial committee including H. C. Frick, George F. Baker, George W. Perkins, Percival Roberts Jr. and Vice President John Reiss. Judge Gary's formal statement is as follows:

"The finance committee of the United States Steel Corporation, after full consideration, has decided to recommend to the Tennessee Coal, Iron & Railroad Co. that it proceed promptly and vigorously with the erection of additional works at Fairfield which are intended to furnish in normal times products for the markets naturally supplied from the Birmingham district, and a particular demand at present on account of the necessities of the government resulting from war conditions. The plans, in detail, have not been completed by Mr. Crawford, president, and his associates, but it is estimated the cost of making these improvements will approximate $11,000,000."

George Gordon Crawford, president of the Tennessee company, has announced that the plans of development are being worked on rapidly and full announcement will be made in a short time. It is understood that the developments will consist chiefly of new steel-making capacity and finishing mills which will be available for the manufacture of shipbuilding steel. The present works at Fairfield consist of wire mills of the American Steel & Wire Co.

In an address at the dinner given by Mr. Crawford, Judge Gary said that since the United States Steel Corporation took over the properties of the Tennessee Coal, Iron & Railroad Co., $32,000,000 had been spent.

Orders 110-Inch Mill

The Brier Hill Steel Co., Youngstown, O., has awarded a contract for a 110-inch plate mill and auxiliary equipment to the United Engineering & Foundry Co., Pittsburgh. The Brier Hill Steel Co., as previously reported, has placed a contract for a 500-ton blast furnace with the Riter-Conley Mfg. Co., Pittsburgh.

New Plate Mill

Of Youngstown Sheet & Tube Co. to Be of Tandem Type

Contracts have been placed by the Youngstown Sheet & Tube Co. for the construction of an 84-inch tandem type motor-driven plate mill which will have a capacity of from 12,000 to 15,000 tons per month. The output will be used principally for the manufacture of larger size of lap weld pipe which requires skelp from 45 inches to 72 inches in width.

The unit will include four continuous furnaces, and will be housed in connected buildings of five sections including slab building, 80 x 140 feet, motor building 80 x 140 feet, conveyor building 80 x 540 feet, shipping building 80 x 320 feet, and furnace and mill building 80 x 280 feet. These buildings will be of structural steel with corrugated iron roofing and siding, except the motor building, which will be of brick construction with composition roof. The Blaw Steel Construction Co., will erect the structural steel; the Mesta Machine Co. the mill and tables; Hilles & Jones, Wilmington, Del., the shears and levels; the Allis-Chalmers Co., the larger motors; the General Electric Co., the smaller motors. The cooling table will be erected by Hyle & Patterson, and the furnaces by Alex. Laughlin. The crane order has not yet been placed. It is expected that the new unit will be in operation within 12 months.

The company's new 12-inch bar mill is completed and will be in operation soon. This mill and the 9-inch bar mill started several weeks ago will have a capacity of about 16,000 tons per month.

Won't Hot Roll

Reports that the Elliott-Blair Steel Co., New Castle, Pa., will build hot rolling mills, are without foundation, according to company officials. Cold rolled strip steel will be rolled, as heretofore. Although only recently put into corporate form, this partnership has existed for the past 20 years.

Ore Movement

Will be Boosted by Means of Clearing Committee

Cleveland, June 12.—Ore and coal shipments on the lakes will be directed by one central agency during the rest of the season. The coal trade through Lake Erie ports has been directed by the newly organized Lake Erie Bituminous Coal Exchange, F. C. Baird, commissioner, since June 1. Today, ore shippers approved a plan to make Mr. Baird chairman of the ore clearing committee, recently established.

The ore clearing plan was evolved by Harry Coulby, of the Pittsburgh Steamship Co., H. G. Dalton of Pickands, Mather & Co., E. W. Oglebay of Oglebay, Norton & Co., Frank Billings of the Tod-Stambaugh Co., and Matthew Andrews of M. A. Hanna & Co., comprising the subcommittee on lake ore movement of the committee on pig iron, iron ore and lake transportation of the American Iron and Steel institute. The plan provides for daily meetings of the representatives of the different ore companies. Each man will bring a list of ships loading, or enroute, giving unloading date and the disposition of the ore. Steps can thus be adopted to prevent congestion either at docks or furnace yards and maximum capacity of the docks and railroads will be effectively employed.

The car supply already has proved insufficient. The promoters of the Coal Exchange expected an average saving of 1½ days in the time cars are held in ports, equivalent to adding a capacity of 52,000 cars. Similar economies are expected from the ore clearing house.

The two plans working together are expected to increase the ore and coal movement by at least 5,000,000 tons.

Lease Stack for Ferro

The Midvale Steel Co., Philadelphia, has closed negotiations with the Wharton Steel Co., Wharton, N. J., for the lease of the latter's No. 1 furnace, which will be used for a period of one year for the manufacture of ferromanganese. The stack has a daily capacity of 150 tons of pig iron. The Midvale company will furnish the manganese ore.

Auto Bids Received

Chicago, June 11.—Bids on automobile trucks and passenger automobiles for government use have been received by the depot quartermaster. Quotations have been asked on 1 to 35,000 trucks of 1½ tons capacity, an equal number of 3-ton trucks and about 4000 passenger cars of varied capacity. Bids have been submitted by 83 truck and body builders, about 80 body builders and a large number of passenger car builders. Bids are being tabulated and will be forwarded to Washington, and awarding of contracts probably to be done from there.

War Demand

For Wire Products at Home and Abroad is Very Heavy

Pittsburgh, June 12.—With domestic activity augmented by demands for shipment abroad, wiremakers are experiencing no difficulty in selling material at from $2 to $5 a ton above published minimum quotations. Nails have been sold at as high as $3.75 a keg, and talk of quotations advancing to $4 a keg frequently is heard. Consumers in Australia and South America daily are sending out inquiries for nails, plain and barbed wire, involving from 100 to 100,000 tons. Moreover, large tonnages of barbed wire are wanted by this country and its allies for military purposes. Scarcely any additional material is available for shipment within the next 90 days.

More Buying

Of Pig Iron at Pittsburgh at the Top Prices

Pittsburgh, June 13. (By wire.)—The Mesta Machine Co., Pittsburgh, is in the market for 10,000 tons of bessemer for shipment in the first half of next year. The Follansbee Bros. Co., Follansbee, W. Va., are credited with having taken 15,000 tons of basic at $50 for similar delivery. A local ingot mold maker has closed for 5000 tons of bessemer on an old quotation of $50, valley. A northern Ohio buyer has increased purchases of bessemer at $55, valley to 3000 tons. Lower grades of bessemer ferrosilicon have been advanced $15 a ton, or $90, furnace, for 10 per cent. The Star Furnace, Jackson county, O., is out for 60 days. The Red River Furnace, Clarksville, Tenn., also is out. Blast furnace coke is selling for $11 and contract foundry coke at $12 to $12.50, ovens.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, June 12.—Expectancy of large buying of metals for war purposes continues to buoy up the metal markets, in the absence of any actual buying in large volume. Spasmodic inquiries are appearing here and there for antimony and lead, issued by shell makers, but the much talked-of governmental action in spelter, copper and lead has not yet materialized. So the metal trade still has its attention riveted on Washington.

Arrangements now under way, by which a committee of representatives of various branches of the tin trade will co-operate with the bureau of foreign and domestic commerce relative to the allotment of tin arriving in this country, have made their influence felt in the tin market. A feeling exists in some quarters that with a freer issuance of permits by Great Britain and with equitable distribution of arrivals in this country, the market situation will be relieved. Spot Straits today is quoted about 60.75c, New York, a decline of about ¼c from a week ago.

The lead market reached the highest price recorded in 102 years, this week, when sales were made of prompt metal at 12c, St. Louis, which compares with an average price for 30 years of 4.4735c a pound. Representatives of leading lead producers have been meeting with governmental authorities at Washington this week and announcement as to the government's requirements has been momentarily expected. Nominal lead quotations follow: Prompt and June, 12c to 12.50c, St. Louis; July, 12c to 12.25c.

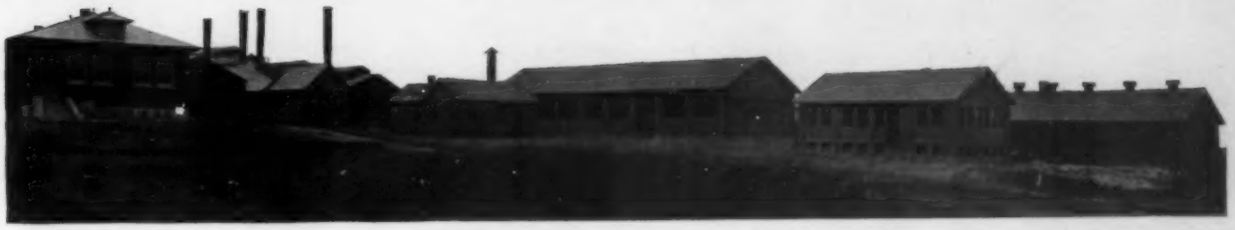
Lethargy still prevails in the spelter market. Despite the lack of inquiry, producers are refusing to make price concessions on the ground that costs of production will not permit further shading. Some prompt prime western is available at 9.37½c, St. Louis, but futures command a premium, some sellers asking 9.50c for positions beyond June. Prime western quotations follow: Prompt and June, 9.37½c to 9.50c; July and August, 9.50c to 9.62½c. Brass special continues quoted about 10c to 10.25c, St. Louis.

The copper market has been slowly but steadily gaining strength. Most of the leading producers now are out of the market for delivery before September. July and August delivery electrolytic seems to be in fairly large supply from second hands, but spot metal is scarce. Electrolytic quotations follow: Spot and June, 33c to 33.25c, on the basis of cash, New York; July, 32.25c; August, 31.50c to 31.75c; September, 30.50c to 31c; fourth quarter, 29.50c. Some casting copper is reported to have been sold recently around 30.50c, but most sellers are asking 31c, cash, New York. Prime lake, prompt delivery, is nominally quoted 32c to 32.50c.

Spot antimony has weakened considerably the past week, offerings now being reported at 19.50c, duty paid, New York; future positions continue strong, as follows: June shipment, from the far east, 15.75c, in bond; July, 15.25c to 15.50c; August, 15c to 15.12½c.

Demand for aluminum is light and the market for virgin metal has shown some signs of weakness. The remelted brands are firm, owing to the high price of scrap aluminum. Quotations follow: No. L virgin, 60c to 62c; No. 1 remelted, 58c to 60c; No. 12 alloy, 42c to 44c.

(*For miscellaneous prices see page* 1319.)



View of the Plant of the Vanadium Alloys Steel Co., Latrobe, Pa.

Art in Making Crucible Tool Steel

Although Science Plays an Important Role in the Production of High-Speed Tool Steel, Each Bar Has an Individuality and Reflects the Character of the Manufacturer

SCHULTZ was a mighty Teuton—a rectangle of massive, yet supple strength. He had sought and found employment as a swaging hand with the Progressive Tap & Die Co., some 20 years ago. Schultz's muscles were not his only commendable characteristic for the commercialism of the new world had supplanted his vague notions of the Junkerism of the old, and Schultz was ambitious to succeed. Fighting step by step, always forward, through various positions as tool forger, toolroom helper and die sinker, rare skill and rounding shoulders gradually replacing his brute strength, Schultz as we find him before the war was foreman of the entire shop. The shop, too, had progressed during this period. The few machines in a low wooden building where Schultz first swung his heavy hammer had long since been discarded. Others came and were discarded or stored to be pressed into service only in emergencies. The low, dark shop with its subsequent lop-sided additions had been torn down and in its place had been reared a modern reinforced concrete and steel tool plant.

Efficiency and shop management he had not studied in text books, but in his 20 years of experience, Schultz had learned well. Each machine in the shop ran with unfailing precision and the flying chips and the clean cuts attested to the correctness of the tool and cutting speeds. The war broke out and the company received its share of the orders for English and Russian shrapnel. The task for Schultz was to produce quantities of precision work in a minimum time so it was not surprising for him to allow the salesman and demonstrator of a high-speed tool steel manufacturer to show him how to double or even treble the output of certain machines by using tools of alloy steel. When chips, blue from the heat were literally torn from the stock by the white-hot points of the tools, amazement was written all over the old German's face and when the tool failed to show signs of wear after long hours of severe service, his astonishment turned to joy as he realized that the real problem before him had been solved. He quickly mastered the details of heat treating and tempering the steel and as the production figures mounted from day to day as more tools were installed and as cutting depths and speeds were increased Schultz's pride knew no bounds and the treatment of high-speed steel became the special hobby of the Progressive company's foreman.

All went well at the plant of the Progressive Tap & Die Co. until the insistence of Schultz's friends that he was wantonly perpetrating war against the Fatherland became so strong that he at last was forced to secure peace at the expense of his position. A new man took his place and the treating of the tools was left to one of the assistants. Production immediately fell off. The tools did not stand up and the tool steel company was accused of substituting a poorer grade of steel. An expert was sent from the steel plant, and although he succeeded in raising the output somewhat, it never attained the splendid record made during Schultz's regime. The new heat-treating man seemed never to have the same luck as his predecessor. On some machines, the average was about the same while

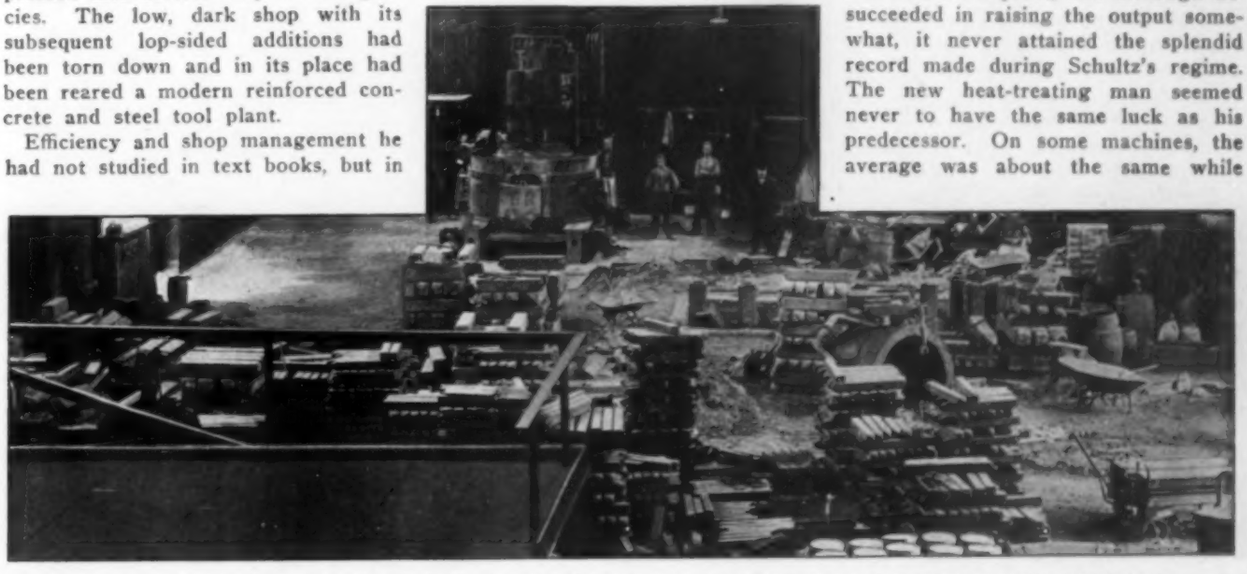


FIG. 1—PARTIALLY COMPLETED MELTING SHOP SHOWING CORNER OF CRUCIBLE FURNACE AND 3-TON ELECTRIC FURNACE

on others it maintained a decided slump.

* * *

The preceding narrative is concisely true of many actual instances which seem to indicate that high-speed steel is still in the experimental state and that its use is confined to experts. What these cases really point out is that the manufacturer of high-speed steel must make a product that is suited to the average conditions in shop practice and may be treated by the man of average ability. With the average treatment of this steel in various plants the results achieved will be the average exceptional increased production generally attributed to the use of tool steel. Where a man studies the work to be done and treats the tools accordingly, as Schultz did, the results will be extraordinary when compared with the average. Successful heat treatment of high speed steel requires no little skill and a great amount of care.

Lack of Understanding Causes Trouble

Because there are so few men employed in heat treating high-speed steel who are gifted with Schultz's exceptional ability, users of this commodity are often prone to attribute their failure to obtain unusual results to the idiosyncracies of the steel. The following outline of the process of manufacturing high-speed steel at the plant of the Vanadium-Alloys Steel Co., Latrobe, Pa., will, perhaps, afford a means of establishing a bet ter understanding between the consumers and the users of this product.

High speed steel is, of course, an alloy of low phosphorus iron with vanadium, tungsten and chrome containing in addition to these elements, small percentages of carbon, phosphorus, sulphur, manganese and silicon. These materials are melted together in graphite crucibles holding about 90 pounds of alloy. After the constituents have been properly fluxed together by heating slowly to a uniform temperature which is maintained for some time, the steel is cast into ingot form. The ingots are reduced to a size by steam hammers, the final reduction to size being accomplished on a rolling mill. At various stages of production the steel is subjected to chemical and physical inspections. The final inspection is a physical one for cracks and seams in the finished stock. This last inspection is particularly rigid.

The basis of a charge for the crucible pots is low phosphorus iron which constitutes about 40 per cent of the total weight. This iron is placed in the pots in the form of 4 to 6-inch pieces cut from strips having a section about 1 x 3 inches. Alloy steel, rejected during the course of inspection, forms another 40 per cent of the charge. Since the chemical analysis of this steel has already been determined during its production, this information is used judiciously by the man who mixes the "medicine". This "medicine" contains the metals that are to be alloyed with the steel and is the third chief constituent of the charge—about 20 per cent by weight. In it are included the tungsten, chrome, vanadium and other metals which are introduced in the form of ferro-tungsten, ferro-vanadium, etc. A very small quantity of ferro-silicon also enters with the "medicine". Extreme care is taken to keep the content of sulphur and phosphorus very low.

Proper Mixing is Essential

While the crucible process of making steel, generally speaking, is one of the simplest methods known to metallurgists, it imposes severe restrictions which call for the purest of constituents and the greatest of care in proportioning the mix and in the heating of the charge. The use of the crucible process precludes the advantages of further refining of the materials in the mix during the period of melting. For this reason, the formula for the mix is carefully determined and is not altered in the slightest degree when the mix is prepared for the pots. All of the materials entering the pot are weighed to a fraction of an ounce. The constituents used for the "medicine" are mixed in a small room near the furnace known as the "medicine room" where the hardening agents are measured with extreme preciseness.

In preparing the various metals for the manufacture of crucible steel in making high-speed steel, it is important that provision be made to produce a slag of the proper thickness and density. An important function

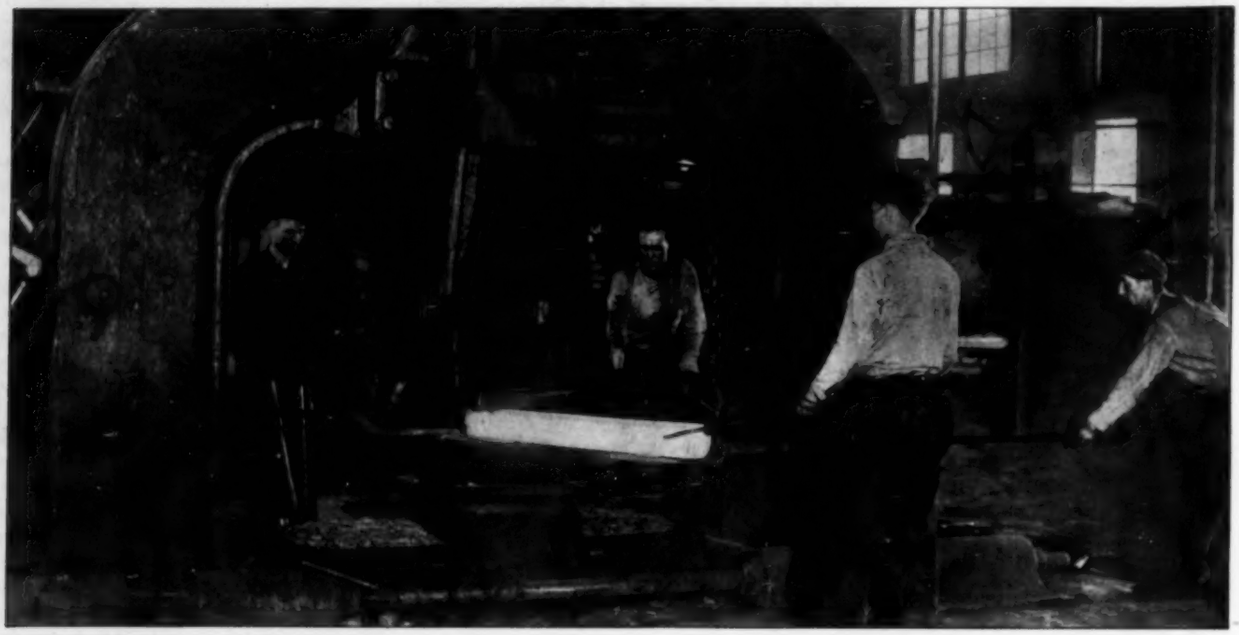


FIG. 2—CROPPING THE END FROM AN INGOT ON A 4-TON STEAM HAMMER

FIG. 3—BILLETS ARE REDUCED TO SIZE ON A 12-INCH, ELECTRICALLY-DRIVEN MILL.

of the slag is to provide a coating to keep the air from the alloy and to protect the graphite pot from oxidation. The materials most easily melted are placed near the top of the pot, so that when melted to the consistency of molasses, they form a covering over the elements subject to the influence of the carbon from the graphite crucible. A characteristic of one of the important elements of high-speed steel, vanadium, will indicate the necessity of properly proportioning the constituents and of heating to the proper temperature. Vanadium has a high melting point and a low specific gravity which are responsible for a tendency for it to float when melted and to combine with the slag instead of the steel. Thus it is seen that the specific gravities and the melting points of the component metals have an important bearing upon such apparent trivialities as the method of placing them in the crucible.

Still There is Art in Steelmaking

Of no less importance that the mix itself is the melting of high-speed steel. To secure a satisfactory alloy it is essential that the steel be heated slowly at a uniform heat. The duration of melting is variable, depending upon the character of the charge. In these days of scientific plant operation, it is interesting to note that the experience of the melter is his chief guide in determining when the melt is ready to pour. Although recording pyrometers are used to measure the temperature of the furnaces, the condition of the melt is judged by the eye of the melter.

The crucible pots are heated in two 30-pot furnaces which are gas-fired and are of the regenerative type. A corner of one of these furnaces may be seen in Fig. 1 which is an interior view of the melting building and shows the 3-ton heroult furnace used for melting scrap. The furnaces are operated at an average of 2,700 degrees Fahr., a temperature which is

FIG. 4—FINAL INSPECTION OF HIGH-SPEED STEEL AND PORTION OF STORED STOCK

maintained for 3 to 4 hours, the average duration of a heat. Under normal conditions, approximately six heats are made in a period of 24 hours.

Skill Required for Teeming

To eliminate the occurrence of blow holes, high-speed steel is not poured from the crucible until it is in an unagitated state. The pouring or teeming of the steel is done by the melter who skims the slag from the molten steel. When all the slag has been removed, the steel is poured quickly into the iron ingot molds by the teemer. This operation requires considerable skill as the molds are of small cross section and the stream of molten steel must not at any time strike against the sides of the mold. The regular ingots have a 4 x 4-inch cross section and are from 28 to 30 inches long, weighing about 79 pounds. Steel from two pots is poured into one mold. The corners are all rounded to prevent burning when reheated for hammering. Where for special purposes for large cutters a large ingot is required, the steel from as many as 30 pots is poured into a ladle and from the ladle into larger ingot molds. Reheating is done in the electric furnace.

Unusual care in handling high-speed steel does not end with the casting of the ingot. During the various hammering processes precaution must be taken to prevent strains due to rapid heating or cooling which are liable to cause cracks and similar defects. When large-size ingots are to be produced, they are rushed directly to the hammer furnace while they are still red hot. The smaller ingots are cooled slowly and stored for future use. Before they are placed in the hammer furnace, they are heated slowly to the proper temperature to eliminate the danger of rapid temperature changes.

The pipes which form on the ingot ends are filled by placing hot-top brick on the top of the mold and pouring steel into the pipe. When the ingots are cooled the top is knocked off to remove the segregated portion. Samples are taken at this time for a carbon analysis. A sample is also taken from each heat for a complete analysis.

Carbon Content Varies

Because the carbon in high-speed steel is subject to more or less variation and may not be regulated with the precision of the tungsten, vanadium and chrome in the "medicine" for the crucible pot, the analysis which is made for carbon at this time determines to some extent the ultimate use of the steel when it has successfully passed through all the stages of production. Generally speaking, tools of large size requiring more or less resiliency of the steel are made from the ingots having a comparatively low percentage of carbon.

The ingots are reduced to billet size on a 4-ton Morgan steam hammer. A 2-ton Chambersburg steam hammer is held in readiness for emergencies. The hammer furnace is fired with coal and is located close to the hammer so that the ingots may be transferred quickly with the aid of a hand-operated telegraph crane. Hammering is one of the most important steps in the production of high-speed steel. It is during this operation that the first ingot defects are brought to light, eliminated or taken as basis for rejecting the ingot. The temperature of the heated ingot must be such that the steel will not burn in the furnace and will not crumble during the hammering. If the ingot is heated too long in the hammer furnace it is spoiled regardless of the correctness of its chemical content. Surface seams appearing while the steel is being hammered are cut from the ingot to prevent the formation of cracks and seams. At the conclusion of hammering, the end of the ingot is cropped off some four or five inches from the end. This precludes the possibility of the pipe end opening and extending further into the core of the ingot.

Sheffield Custom Prevails

The hammering of the steel is so important that the old Sheffield custom of allowing the head hammerman to employ his own crew is followed in the plant of the Vanadium company. The hammerman's compensation is based upon the tonnage and quality of his work. He directs the chipping of defects from the steel and indicates the temperature at which the steel is to be worked. The accuracy of these hammermen is unusual; the steel as a rule is within 1/64-inch of the specified size when it comes from the 4-ton hammer which is shown in Fig. 2. Another interesting feature in connection with the hammering and recogging operations is that approximately 12 per cent of the ingot weight cast is produced in the hammer shop as hammer scale.

Following the hammering, the billet is cogged and recogged to size. The cogging is accomplished on 1¼ and 1½-ton Chambersburg steam hammers. A rigid physical examination takes place between the hammering and cogging of the steel. Surface seams are removed as far as possible with the aid of three swing-arm grinders. The billets are usually sent to the 12-inch mill in sizes 4 x 4 inches, 2 x 2 inches and in special sizes under 2 inches. The mill, shown in Fig. 3, is electrically driven. Here the steel is reduced to finished sizes, generally in rounds or in squares, although some special shapes such as drill stock are made. The maximum capacity of this mill is about 5½ tons a day. After rolling, the steel is placed in pipes approximately 12 feet long and 10 inches in diameter and packed for annealing. The annealing furnaces are coal-fired and are equipped with recording pyrometers. The steel is heated to a temperature of 1,650 to 1,700 degrees Fahr. for a period of 12 hours.

Inspection is Important Factor in Production

From the annealing furnaces, the steel is taken to the stock building where a final rigid physical inspection is made. Small surface cracks are removed by file or by portable grinders. This inspection is illustrated in Fig. 4. One of the most salient features in regard to the manufacture of high-speed steel is that an average of 50 per cent of the total ingot weight is rejected during the process. About 15 per cent of the labor in the plant is devoted to the inspection of the steel at different stages. Steel passing the final inspection is weighed on a Toledo automatic scale and is stored or prepared for shipment. Strips of steel are bound together for shipping with ¼-inch iron rods. In addition to being tagged, directions are bound to the package under a wrapping of heavy burlap.

The rejected steel from the various shops and from the final inspection is returned to the melting shop, shown in Fig. 1, where it is melted in an electric furnace, cast into ingots and prepared by cutting into suitable pieces for use in the mix. The furnace is supplied by a 22,000-volt line and is equipped with General Electric Co. automatic control which handles the power coming from the transformers at a reduced voltage. The melting building is equipped with an Alfred Box & Son 5-ton electric traveling crane.

Laboratory Tests Made Rapidly

The range of influence of slight variations in the constituents upon the characteristics of high-speed steel makes the role of the chemical and metallurgical laboratory an important one in the production of this commodity. A new, well equipped testing laboratory has just been completed by the Vanadium company, which, in conjunction with the old laboratory, will be used to carry on routine testing and for experimental research. A complete chemical analysis is made of one ingot from each heat. These tests, which necessarily are unusually complete, are made in an interval of 24 hours after the sample has been taken from the crucible. Analysis for the various families or groups of elements is made by different chemists, so that each special-

izes on one group and the work is completed with rapidity. After the analysis has been made, a number corresponding with the laboratory record is assigned to the ingots, the indentity being retained to be used in determining the type of tools to be made from the ingot, and to permit of investigation in case of failure of the steel in the hands of the user.

A particularly interesting phase of the manufacture of alloy steels is the relation of each constituent to the characteristics of the finished tool. Tungsten outweighs all the other elements of high-speed steel. The percentages of this metal vary from 16 to 20. Approximately 22 per cent is introduced in the mix, but a part of this amount enters the slag so that, on the average, the finished product contains but 18.5 per cent. The introduction of tungsten into the alloy imparts to the tool a large share of its ability to retain a hard cutting edge at a red heat. Chromium, like tungsten, increases the hardness of the cutting edge, but it has the undesirable feature of carbon which tends to make the steel brittle. This, however, is true only to a lesser degree, but percentages of chromium greater than five would probably make the steel too hard for any purpose except, perhaps for lathe-tool bits. In general, it has been found advisable to use proportions of chromium somewhat less than one-fourth of the tungsten content, making the average percentage of this metal about 4.14.

Vanadium Improves Cutting Edge

Vanadium originally was introduced into high-speed steels as a scavenger but tests have indicated that amounts between 0.8 and 1.5 have a tendency to enhance the cutting edge of the tool without adding to its brittleness as do tungsten and chromium. Another scavenger is silicon. This element has properties similar to manganese but has a tendency to produce brittleness so it is not used in percentages greater than 0.2. The addition of manganese seems to retard the formation of double carbides of tungsten. It also is effective in removing sulphur from the steel. A small amount adds toughness and strength to the steel but amounts in excess of 0.15 to 0.25 cause the steel to be subject to cracking while it is being tempered. Sulphur and phosphorus in perceptible quantities are detrimental to good tool steel. The one has a tendency to cause cold shortness; the other, to cause the tool to crumble or crack when heated.

Makers of high-speed steel are continually experimenting by adding rare elements such as uranium in an effort to improve the cutting and wearing qualities of their steel. Recent tests made on steel having from 4 to 5 per cent of cobalt have given some interesting and encouraging results which indicate that this element hardens the steel considerably and improves the cutting edge an appreciable amount. Another good feature is that it reduces the wearing of the tool to approximately 1/3 that of normal. The addition of cobalt has its disadvantages in that it makes tempering more difficult and produces a tendency for the steel to decarbonize and crack.

One of the trade customs which seems to have been too generally adopted without particularly logical reasons, is that of demanding tool steels of certain defined analyses, rather than requiring the purchased products to meet specifications based on performance. It is true that in industrial practice no two tools work under exactly similar conditions, but the manufacturer would be less hampered were he required to meet a just standard of performance instead of being expected to qualify for all kinds of work handicapped by restrictions upon the composition of his steel. Users of tool steel often require the steel to meet certain physical specifications which are conducted when the steel is not under actual working conditions. To a man who has been accustomed to drawing carbon-steel tools to color and proving his work with a file, it does not seem reasonable that tools which will do the work of those made of high-speed steel may easily be touched with a file when cold. Such is the case, however, and it seems unreasonable to judge high-speed steels upon any other basis than that of actual performance.

Another fallacy which prevails to some extent among users of high-speed steel is the belief that it is impossible to burn tools while tempering. Doubtless this opinion arises from the fact that tools will operate at a white heat, retaining their edge and not working appreciably. Regardless of this, however, every heating during tempering will burn the steel and will cause failure or reduced efficiency when the tool is brought into contact with its work.

Although tool steel may safely be said to have passed from the experimental stage, the opportunities for development in the field of alloy-steel making are unlimited. New industrial conditions will impose new difficulties upon the makers of high speed steel. It is conservatively said that the demand for American-made shells increased the demand for alloy tool steels five-fold and did more than any one other incident in its development to remove it from the status of laboratory production to that of an industry, working night and day to meet the demands of consumers. The precision required of shell makers in this country coupled with the mad desire for maximum production subjected tool steels to the most rigid tests of performance man could devise.

Discusses Labor Problem

In discussing "The Man Problem" before the Railway Club of Pittsburgh, D. C. Buell, director of the railway educational bureau, stated that there are five main considerations which make for permanency in an organization. These considerations, he claimed, are good wages, permanent work, reasonable working hours, fair treatment, and opportunity for advancement. Pleasant surroundings, and comfortable sanitary working quarters are important supplementary conditions in the opinion of Mr. Buell.

The above conditions will apply in a large majority of cases. In the minority of cases, however, employes may continue in positions where conditions are not entirely satisfactory, due to the fact that family ties, the ownership of a home or disinclination to move to another town may overweigh unsatisfactory conditions of employment. Again, in other organizations there is a certain percentage of employes who have not the mental courage to strike out and make a change. Then, again, there are always a courageous few who rise against difficulties and make good despite of conditions. Such employes endure improper conditions, firm in their belief that they will be promoted or transferred to better places in a reasonable time.

It is also true that any one of the conditions that have been stated as essential for the permanency of an organization may have sufficient weight to hold an employe although other conditions are by no means ideal. With some men, the opportunity to earn high wages, or a wage higher than the average, will outweigh every other condition of employment, even to the limit of injuring health or the hazard of personal injury or death. The assurance of permanent work and a fixed routine will interest some whose mental make-up is such as to be disturbed by change of any kind. Reasonable working hours will attract some, while an equal number will be attracted by the opportunity for making extra money by overtime work.

Fair treatment and the opportunity for advancement, coupled with the reasonable wage seem to be the surest means of holding employes and to prevent the breaking up of an organization due to the winning away of experienced employes by other firms by the offer of higher wages.

Hydraulic Pressure Tests of Pipe

A Resume of Recent Experiments Which Were Performed at the University of Kansas on Welded and Screwed Pipe Connections When Subjected to Internal Hydraulic Pressure

BY F. H. SIBLEY

THE interest created by an article that appeared about a year ago giving a report of tests of oxy-acetylene welded pipe connections and screwed pipe connections tested under tension and compression encouraged the experimenters to carry on a second series of tests. These tests were conducted in the machine construction laboratory of the University of Kansas and had for their purpose the determination of the strength of welded and screwed connections in steel pipe of various sizes when subjected to internal hydraulic pressure applied at various degrees of intensity.

The pipe samples, which were cut

FIG. 1—BULGED 4-INCH SPECIMEN

from standard black steel pipe, were from the same stock and hence probably of uniform quality. The welded specimens were made by operators of the Oxweld Acetylene Co., Chicago. The screwed connections were made up with malleable iron couplings and tees by expert pipe fitters. The pieces for the butt welds were cut at an angle of about 60 degrees in a pipe-cutting machine to get the necessary "V" groove for welding. The "T" welds were made by cutting a hole in the run and butting the outlet against the run. The ends of all the specimens were sealed by welding in plugs or discs made from boiler plate punchings. Two of these discs are shown at the bottom of Fig. 1.

The specimens were subjected to pressure by means of a small hydraulic pressure pump, shown in Fig. 5, which was made especially for this work. The specimen under test was placed about 25 feet from the pump and connected to it by means of a ½-inch copper tube. A pressure gage with a check valve opening toward the gage was placed between the pump and the specimen. The check valve was necessary to steady the pressure in order that satisfactory readings could be obtained because some of the samples carried pressures greater than 5,000 pounds per square inch before failing.

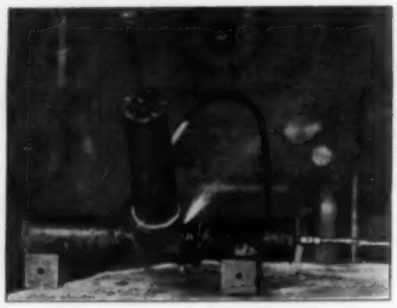


FIG. 2—SPECIMEN OF PIPE UNDER PRESSURE

Methods of Failure of Various Specimens Under High Pressure

Welded 2-inch and 3-inch specimens are shown in Fig. 4. These failed by splitting along the longitudinal seams of the pipe, the split stopping at the welded section. The 4-inch welded specimens in Fig. 1 bulged under the high pressure but did not fail in either the weld or the pipe seam. The mode of failure of two of the screwed connections is shown in Fig. 3. The bursting pressures for the screwed connections were below that of the welded specimens and all failed in the fitting. Difficulty was experienced in testing the specimens made up with screwed fittings because sand holes develop and the water leaked through the castings to such an extent that it was almost impossible to reach the point of rupture. Fig. 2 shows one of the screwed "T" specimens under test and illustrates clearly the condition just mentioned. From data given on page 1287 it may be seen that in only one case was there failure in the weld which did not develop until 3,850 pounds per square inch pressure was applied. This brings out the point that while leaks are much less likely to occur in welded than in screwed connections they are the principal causes of difficulty. Therefore, pipe lines that are to be subjected to high pressure, if properly tested for leaks when installed, should give no trouble under service. The results of this series of experiments is thought to substantiate the conclusions given in the previous series, namely: The strength of a welded pipe connection is practically the same as that of unwelded pipe. By slightly building up the weld it can be made stronger than the rest of the pipe; the strength of the welded pipe connection is greater than that of the malleable iron screwed fittings; although a careless or inexperienced operator might produce a leaky

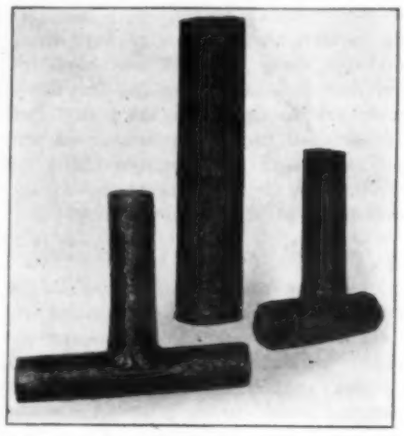


FIG. 4—WELDED 2-INCH AND 3-INCH SPECIMENS

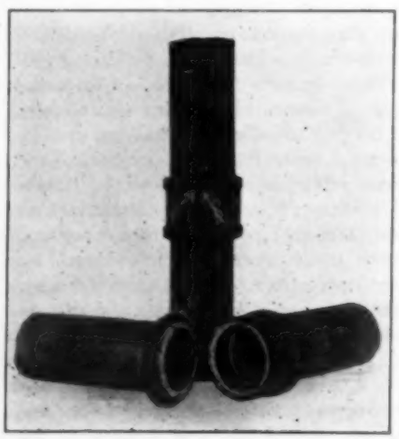


FIG. 3—SHOWING MODE OF FAILURE

From a report by F. H. Sibley, professor of mechanical engineering, University of Kansas, assisted by Messrs. Maris, Ruth, Schooley, Jesperson, and Dryden.

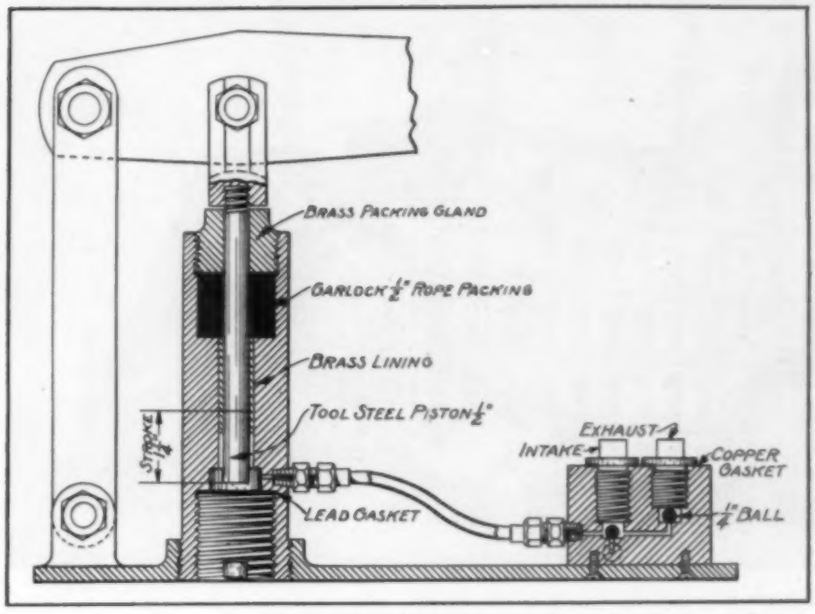


FIG. 5—DETAIL OF HIGH-PRESSURE PUMP

joint, if the pipe line is tested for leaks when installed it should give no difficulty in service.

An Unusual Type of Steam Boiler

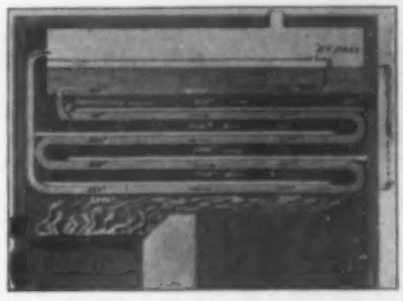
The underlying principle of the downflow type of steam boiler is shown diagrammatically in the accompanying illustration, taken from a paper by John C. Parker, presented at the annual meeting of the American Society of Mechanical Engineers. In this type of boiler the reservoir or drum has separate compartments for water and for steam, with a swinging valve between, which automatically forces water into the tubes to replace that which is discharged by each drop in pressure. The straight water tubes are arranged in the form of flattened-coil elements leading downward from the water compartment with direct connections from the bottom ends to the steam compartment. A check-valve at the water-inlet end of each element prevents reversal of the flow.

The water is maintained at a given level in the lower compartment of the reservoir through a feed connection in the regular way. It flows downward by gravity into the elements and seeks the same level in the upcast. When heat is applied, the water in the upcast is soon discharged into the reservoir by the expansion of the steam formed in the lower tubes. The water then runs down from the reservoir to regain its level in the upcast. This is frustrated by continuous evaporation, mainly in the lower tubes. The more the fire is forced, the greater is the proportion of steam in the upcasts, the larger is the unbalanced head of water, and the more rapid is the flow through the tubes.

Following are some of the new ideas embodied in the latest cross-drum design of downflow boiler: The diaphragm is omitted. The front drum serves as the water compartment. The steam drum drains into the water drum through a three-tube connection controlled by the anti-priming valve. One 4-inch tube connection serves as a bypass. The cross drums are more convenient for inlet and upcast connections. The drums are believed to be free from unequal strains.

The feedwater-heating coiled element is swung so that it can be moved 2 inches sidewise at either end when necessary to remove and replace a junction box, or when access to the handholes, entirely clear of the inlet or upcast tubes, is desired for cleaning or replacing tubes.

The bottom row of tubes goes through a crossbar at the rear end which supports the tubes above it. The whole bottom row can be moved 2 inches sidewise to bring the upcasts



CROSS SECTION OF DOWNFLOW BOILER

entirely clear of the junction boxes or handholes when desired. The bar is carried on ¼-inch rollers. It is made in box shape to form an air trap to prevent leakage of hot gases from the combustion chamber into the rear casing. This box has small holes to admit sufficient air to direct any leakage into the combustion chamber in place of the reverse direction. This keeps the bar and rear casing cool and prevents gradual deterioration from excessive heat. The movable box joints and openings where the tubes pass through are made fairly tight so that the leakage is small.

In the new downflow design, the entire bottom row of tubes operates on the inclined-tube principle. The flow through the two bottom tubes of each element is parallel in place of serial. These two tubes now discharge directly into one 4-inch upcast like the two staggered bottom tubes of a Babcock & Wilcox Co. section.

Hydraulic Pressure Tests

Size pipe, inches	Type joint	Pressure at failure pounds per square inch	Maximum pressure pounds per square inch	Nature of failure	Condition of weld
2	Welded "T"	4,400	4,400	Seam split	O. K.
2	Welded "T"	2,200	2,200	Leak in seam	O. K.
2	Welded "T"	4,750	4,750	Seam split	O. K.
2	Screwed "T"	2,350	2,750	Sand holes in fitting	.....
2	Screwed "T"	500	2,000	Sand holes in fitting	.....
3	Butt Weld	.....	5,300	———	O. K.
3	Butt Weld	4,950	4,950	Seam split	O. K.
3	Butt Weld	.....	4,250	———	O. K.
3	Coupling	3,950	3,950	Coupling split	.....
3	Coupling	3,400	4,400	Leak in coupling	.....
3	Welded "T"	.....	3,500	———	O. K.
3	Welded "T"	.....	4,250	———	O. K.
3	Welded "T"	.....	3,505	———	O. K.
3	Screwed "T"	350	2,700	Sand holes in fitting	.....
3	Screwed "T"	300	3,100	Sand holes in fitting	.....
4	Butt Weld	.....	5,100	Bulged	O. K.
4	Butt Weld	.....	3,250	———	O. K.
4	Coupling	300	3,000	Leak at threads	.....
4	Coupling	750	2,600	Leak at threads	.....
4	Welded "T"	3,850	5,100	Leak in weld	Leaked
4	Screwed "T"	1,000	1,950	Sand hole in fitting	.....

Photo by Harris & Ewing.

The State, War and Navy Building—The Scene of War-time Activity

How Government at War Buys Steel

BY L. W. MOFFETT

Washington Staff Correspondent of The Iron Trade Review

PURCHASES of steel by the United States government under war conditions are being made on a basis far different from that applying during normal times. Although the nation is only in the preliminary stage of hostilities, the government has already adopted various innovations for satisfying its tremendous requirements of war materials. Necessarily, steel shares prominently in these vast needs, and must be obtained in huge quantities. At the outset it can be said that American steel manufacturers have responded loyally and promptly to the call of their government. The demands being made and to be made upon them are stupendous. For not only are they to supply this government, but also our European allies.

When the United States severed diplomatic relations with Germany, it was readily seen that it would be only a matter of a short time until a state of war would be declared by congress. Grasping this situation, steel manufacturers came to Washington offering without reserve their personal services and their plants for the welfare of the country. Precedence as to delivery and prices was given to the government. Every other line of activity was to be subordinated, if necessity demanded it, on behalf of the nation.

These offers were received by the government with extreme gratification. The ordinary had given way to the extraordinary. Some times at the initiative of government representatives and other times at the initiative of the steel manufacturers, highly important conferences were held in Washington. They are continuing daily. Plans for close co-operation between the government and manufacturers have been taken up at these conferences. Some have been worked out and the machinery set in motion for the expeditious and ample supplying of the steel needs of the government. In that sense, and to that extent, the steel industry has been placed on a war footing. Much remains to be done. By reason of a constant effort to concentrate authority for purchasing steel, progress is being made in a more or less satisfactory manner. To do this the encumbering restraints attendant upon a democratic form of government have had to be removed, and many have been eliminated. It is an unconscious recognition, perhaps, that a democracy is not an effective machine to prepare for and conduct a war. So, to the desired degree, democracy is being laid aside temporarily, and centralized power is taking its place.

Ridding itself of the old order of things, one of the first acts performed by the government was the wiping out of promiscuous competition for supplies. While competitive bidding still exists in some fields with regard to selling to the government, it is relatively slight. In many important cases it has ceased entirely. The government, which, in normal times, has been ready to prosecute if competitive bidding were not observed, has now compelled the abandonment of this system to a great extent, with the prospect that it will be ended entirely soon. Again, there no longer are sharp differences between manufacturers and government officials. In their place has come a period of broader reciprocal relations.

The scheme of organization of new

War Steel Needs Huge

WHAT the government's total steel requirements for war will amount to in tonnage is the big unsettled question that confronts producers and consumers and overhangs the iron and steel market with tremendous importance. An estimate by a prominent sales official of the Carnegie Steel Co. places the aggregate at not over 10 to 15 per cent of capacity which, based upon the 1916 production and the increases of works facilities about to be put into service would mean not exceeding 3,500,000 to 5,200,000 tons of finished rolled products of all kinds for the coming year. Other estimates place the government's portion much higher. The war and navy department requirements for 1917, which have been arranged for with the mills, total about 600,000 tons. The standardized ship program calls for 1,000,000 tons of steel in 18 months.

buying methods, while incomplete, has borne fruit. It is constantly increasing in effectiveness and results will continue to grow, it is believed, in ratio to the thoroughness of plans now under way to further coordinate the purchasing powers of the government. Additional bureaus for this purpose are being created by both the government and by private manufacturers. More uniformity in the matter of prices and distribution promises to come about. Interest in this is heightened by the important fact that the government of the United States is to become the agent for its allies in buying steel, munitions, food and all other supplies. Thus this government will become by far the most powerful purchasing agent the world has ever seen.

Plan Supreme Buying Board

It is not unlikely that, in acting in this capacity, the government will, for the sake of efficiency, create a central body, a sort of a priority board, with supreme power as to what shall be bought, as to the prices to be paid, and as to the manner of distribution among plants of the country, together with the division of supplies among the allied nations, including the United States. This particular plan is now being worked out by the administration, and is in direct charge of Secretary of the Treasury William G. McAdoo. It involves a tremendous economic readjustment looking toward more closely concentrated authority over purchases of supplies. The body constituting this board, as proposed, would consist of five prominent business men. The suggestion for its creation grew out of conference in Washington between members of the British war commission and officials of this government. In a word, the proposed board would take over the control of food, of munitions, and of transportation. Automatically, this would build up a ministry in those three particular lines. Such an organization could quickly be perfected because of existing government machinery, such as the council of national defense, made up largely of business men, with its numerous departments and committees, and the regular bureaus of the government. These organizations could and, of course, would, co-operate with the purchasing board.

What may come about through plans being made for further coordinated buying can only be hazarded. Yet there are signs which may point the way to the answer. It was only recently that Secretary of the War Newton D. Baker issued an order suspending the law which requires advertising for bids. The emergency existing was held to justify the suspension. Now, the war department is buying most of its ordnance and other supplies directly from its bureaus in Washington and depots and arsenals throughout the country. A manufacturer is asked what price he will charge for certain materials. If the price is satisfactory, as is generally the case, the contract is closed and production started at once. Where time will permit, the war department takes up the matter of contracts with the munitions board of the advisory commission of the council of national defense. This board frequently arranges prices with manufacturers. It has no authority to issue purchase orders, make contracts or bind the government in its purchases. In an advisory way it supervises terms of contracts. Another significant development bearing on the question of uniformity of prices took place recently. The board of munitions, with navy and war department officials, took up the consideration of the idea of placing contracts for ordnance and other supplies upon a basis of cost of production plus a certain percentage of profit. That plan still is under discussion, and may be adopted, for as broad an application as possible. It is obvious it could not be applied successfully or economically to all supplies, but could be, authorities think, to those

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BERNARD M. BARUCH,
Chairman of Metals Committee of Defense Council

of a more or less standardized character. The plan to be decided upon by the departments and board probably will become the policy of the entire government, both as to supplies for itself and for its allies. There appears in this connection to be a well defined purpose not to narrow profits to a basis that would endanger industry, and thus cripple the government's military machine.

So far as structural steel for the war and navy requirements for 1917 is concerned, a splendid system has been inaugurated regarding purchases and delivery. This was made possible as the result of the agreement reached a few weeks ago whereby manufacturers promised to provide material to these two departments for the period named at base prices of 2.90c, Pittsburgh, per pound for plates, and at 2.50c, per pound for shapes and bars. These requirements will aggregate approximately 600,000 tons. After a price of 16.50c per pound had been determined upon as the price of 45,000,000 pounds of copper for the war and navy departments, the council of national defense took up the matter of fixing a price for structural steel. It was found that the same plan for fixing the price of copper could not be applied equitably to steel. The copper figure was based on the average price for the past 10 years. It was shown that it would be entirely unfair to the steel manufacturers to determine a price for structural material on a similar basis. It was seen that to do so, the steel producer would be left without profit.

Steel Men Prominent Figures

Negotiations then were taken up between Bernard M. Baruch, chairman of the committee on metals of the advisory commission of the council, and a committee of manufacturers named by the American Iron and Steel Institute. Mr. Baruch also represented the council in fixing the copper price. Conferences were held in New York City. While there is said to have been some difference of opinion between the council, represented by Mr. Baruch, and the steel manufacturers, it soon was discovered that it was only of a minor character. As a result the committee selected one of its members, President James A. Farrell, of the United States Steel Corporation, and James B. Bonner, manager of sales of the Carnegie Steel Co., at Philadelphia, to go to Washington and close negotiations with Secretary of the Navy Josephus Daniels, a member of the council of national defense. After a few hours' discussion between Messrs. Farrell and Bonner and Secretary Daniels, the prices for plates, shapes and bars were decided upon, and an agreement signed. The general committee on steel and steel products of the council of national defense consists of E. H. Gary, chairman, board of directors, United States Steel Corporation, ex-officio; James A. Farrell, president, United States Steel Corporation, chair-

man; C. M. Schwab, chairman, board of directors, Bethlehem Steel Corporation; A. C. Dinkey, president of the operating companies of the Midvale Steel & Ordnance Co.; John A. Topping, chairman, board of directors, Republic Iron & Steel Co.; James A. Burden, president Burden Iron Co.; E. A. S. Clarke, president, Lackawanna Steel Co.; Willis L. King, vice president, Jones & Laughlin Steel Co.

Immediately upon the agreement as to prices and in order to facilitate the government's business, the committee established headquarters in Washington. The offices of the Steel Corporation at the capital in the Wilkins building were selected. Mr. Bonner was chosen as the active agent of this committee which represent a clearing house for purchases of structural steel for the government. Selection of Mr. Bonner to act in this capacity was in recognition of his capability for discharging the task imposed upon him. His experience as a sales agent for the Steel Corporation in government business, thoroughly has acquainted him with the machinery of both the manufacturing and the government ends of this work. No time was lost by Mr. Bonner in organizing his staff. Experts were transferred from various offices of the Steel Corporation to assist the regular corps in the Washington offices. These headquarters now occupy nine large rooms, with a working force of twenty-five employes.

The plan decided upon to expedite delivery of material for the government was made possible by the loyal cooperation of steel manufacturers throughout the country. In accordance with this plan, the bureau of supplies and accounts of the navy department makes out requirements for plates, shapes and bars. These requirements are submitted to Mr. Bonner as the agent of the committee of the American Iron and Steel Institute. The committee thereupon makes a recommendation to the bureau as to the manner of distributing the tonnages, based upon the individual capacity and working conditions of the various steel plants. The bureau, acting upon these recommendations, thus is assured prompt delivery of material. It is being given precedence over all other buyers. So far, it is understood, the government has not purchased any large structural tonnages under the fixed price policy, but is about to do so.

Bureau Employes Swamped

The bureau in the past has shown itself to be a capable organization. It was able to measure up fully to the tremendously added duties which fell upon it when the navy department went on a war footing and began sending out bids and placing awards for extremely large requirements. Its organization has been expanded perhaps fivefold to cope with its vastly increased duties. Employes are literally buried with work. Their desks are piled high with specifications and bids, inquiries, and all sorts of communications. Emergency requirements come up unexpectedly, and many spot orders are being placed with manufacturers. These extraordinary conditions naturally have dislocated, to some extent, the work of the bureau. Yet its machinery is in such good condition that the dislocation is hardly noticeable. This bureau is the great purchasing organization of the navy department. It buys virtually all of the steel for the department.

The bureau of ordnance of the navy department is an active buyer these days, as may be imagined. It is purchasing large quantities of ordnance material direct from manufacturers, and, like other government departments, it is being given precedence in the matter of delivery as well as of prices. Fixing of prices for ordnance as yet has not been done upon an arbitrary basis as in the case of structural steel. The munitions board of the council of national defense has, however, caused orders to be placed and has established certain prices in special cases on ordnance material.

An interesting plan has been adopted with regard to supplying copper necessary for the manufacture of ordnance material. In effect, the producer of ordnance buys the copper from the government. The latter, having fixed a price for copper, furnishes it to the ordnance manufacturer at that price, and makes an allowance to the ordnance manufacturer for the scrap copper produced in the making of forgings and guns. The council of national defense also has fixed prices for time fuses and cartridge cases. But the navy department, through Secretary Daniels, was the first government agency to fix prices under near-war conditions. That cabinet official initiated the plan when certain naval vessels were contracted for upon a basis of cost of production plus a profit of 10 per cent. Negotiations now are under way with regard to the furnishing of structural material for the vast fleet of steel and wooden vessels to be built by the United States shipping board. Estimates have been made that the board's requirements will call for 1,500,000 tons of steel. The manner of buying it and prices to be paid are expected to be determined soon.

The harmony which sprang up immediately between manufacturers and government officials after the war emergency arose, has been most refreshing. Incidentally, it has produced an interesting spectacle. Ordinarily, Washington does not harbor many steel manufacturers. But since the emergency arose, they are to be found in the national capital in varying numbers almost any day, from the most prominent to those who are less conspicuous. It seems almost that the government has commandeered their services. Or, it may be better to say, they have readily volunteered their services to the government and are helping it greatly in this hour of pressing need.

The Future of Large Turbo-Generators

BY D. S. JACOBUS

THE comparison of the results obtainable with large steam turbines and gas engines is a most interesting one, showing, as it does, that the thermal efficiencies of the two types of prime movers will be about the same for the power plant considered, where blast furnace gas is used for fuel together with coal which is used in small amounts during occasional shortages of gas supply. When it comes to figuring the total charges for the plant per year, the balance is strikingly in favor of the steam turbine, as Mr. Rice's figures indicate that the total charges for the steam-turbine plant would be about one-half that for the gas engine plant with its auxiliary steam plant.

High Efficiency Claimed

Mr. Rice states that by using the most modern equipment of boilers, superheaters and economizers, with gas which is passed through primary washers, that an efficiency of 81 per cent can be obtained. This figure may be reached with the proper equipment and the best sort of operation for a continuous load. To obtain the best efficiencies with blast furnace gas there must be but little excess air supplied for combustion and the gas must be completely burned before the products of combustion pass upward between the boiler tubes. To accomplish this, there must be a sufficient furnace volume so disposed that there will be a proper path of travel for the flames, and the gas

A discussion of a paper on "Recent Installations of Large Turbo-Generators," by Richard H. Rice, which was presented at the recent meeting of the American Iron and Steel Institute. Mr. Jacobus is advisory engineer, Babcock & Wilcox Co., New York.

burners must be arranged to give the proper proportions and mixing of air and gas.

Recent developments with burners arranged so as to bring the pressure of the gas up to the outlet and designed to give an intimate mixture of the air and gas before entering the furnace have shown that that higher furnace temperatures can be maintained than in the older practice and that the gas can be burned with a shorter flame than in certain of the older forms of gas burners. Higher furnace temperatures and the ability to burn the gas within a given furnace volume and the proper design of the boiler and its economizer make it possible to obtain the efficiency given by Mr. Rice.

Trend Toward Economizers

Mr. Rice deals with the possibilities of future development, showing that an increase in economy can be secured through an increase in the steam pressure and temperature and by paying attention to certain features of economizer operation. As time goes on, undoubtedly, the trend of progress will be in this direction, as the increase in the cost of fuel will make it possible to install more elaborate and expensive systems than those which now give the best commercial returns.

In the comparisons, the gas-engine plant included a reserve steam plant for carrying a portion of the load in case of emergencies. It would be interesting from a thermodynamic standpoint to compare the efficiency obtainable from the best gas-engine plant having no steam reserve plant with that obtainable from the best modern steam-turbine plant, the efficiencies being based on the heat in the gas used by the gas engines and on the heat in the coal or gas used by the steam-turbine plant. It would also be interesting to make a comparison of the heat of combustion of the coal, the coal in one case being gasified in producers and the gas supplied to the gas engines, and in the other, burned under the boilers. Such a comparison would not be a commercial one, as all fixed and operating charges would be eliminated, and further it would not form the basis of a fair comparison as the reserve steam plant is necessary to secure the same approximate degree of reliability for the gas-engine plant as for the steam-turbine plant, and the fuel required for the reserve steam plant should be included. The comparison nevertheless would give interesting data respecting the thermodynamic possibilities apart from reliability and fixed charges. It would appear that the results will indicate a somewhat greater coal consumption for a gas-engine plant where the coal is gasified in producers than for a steam-turbine plant, which is contrary to the ideas of many.

Mr. Rice speaks of possibilities through combined gas-engine and steam-turbine plants, pointing out that a steam-turbine plant operated by the waste heat from a gas engine involves such a large expense in comparison with the increase of power as to make it unattractive under existing conditions. Should the cost of fuel be great enough, a plant of the sort might be commercially practicable, but it would seem that this will not be the case for a long time to come.

In the gas engine we obtain high efficiencies at the high temperature end of the cycle, but are unable to utilize the low temperature end. In the steam turbine with modern condensing apparatus the low temperature end of the cycle is utilized to the fullest extent. It would therefore appear that there are great possibilities in combining the two. On working out an actual case it will be found that the work of the steam turbine would be comparatively small, amounting to, say, 10 per cent of that of the gas engine, and it can be seen that the large amount of additional expense and complication involved would offset the saving in the cost of fuel unless the fuel is comparatively expensive.

New Developments are Promising

Time and time again those of inventive minds have proposed new cycles for the production of power. In most cases these have been impractical, or if promising from a thermodynamic standpoint, have not been so commercially. Mr. Emmet, who has done so much for the steam turbine is working on the development of a cycle where the work at the high temperature end is done by a turbine driven by the vapor of mercury and the work at the low pressure end is done by a steam turbine. This combination promises as high or even higher efficiencies than are obtainable through the combination of a gas engine and a steam-turbine plant and merits investigation.

Chemical Reactions of Iron Smelting

BY HENRY P. HOWLAND

PRACTICALLY all of the scale, scrap, iron and steel in the world today had as its first step, to be produced in the blast furnace. All of the principal iron ores are a chemical combination of iron and oxygen. The function of the blast furnace is to deprive the ore of its oxygen and then to melt the remaining iron. Mr. Mathesius' article deals entirely with the reactions between the carbon of the coke on the one hand and the oxygen of either the air or the ore on the other hand. It is impossible to change the quality of the oxygen in either the air or the ore. We have, however, learned by sad experience that we can change both the quantity and quality of the carbon in the coke.

The existence of the blast furnace depends upon the simple fact that a large enclosed body of coke cannot be burned by air to CO_2 (carbon dioxide). To state it another way, if we have a furnace full of coke only, the gas coming from the furnace top would contain carbon gas, only in the form of CO (carbon monoxide). This CO is in search of another atom of oxygen and it is the business of the blast furnace to satisfy this desire by introducing iron oxide, (Fe_2O_3). As the iron ore introduced at the furnace top works downward through the rising current of CO gas, most of it loses its oxygen, thus becoming Fe ready to be melted in the hearth. This reduction of Fe_2O_3 by CO is termed "indirect reduction".

The problem of blast furnace efficiency is to bring as much as possible of the iron ore and CO into intimate contact. This results in a minimum of CO leaving the furnace without having met some of the iron ore and also in a minimum of the iron ore getting down into the furnace hearth without having lost its oxygen to the CO.

When the iron oxide arrives at the hearth, there is only one thing that can happen, namely, the oxygen must be removed by means of unburned carbon, or as we term it, "direct reduction".

The fact that the direct reduction of iron oxide by carbon takes place in the hearth and that this reduction absorbs a great amount of heat tends to make the hearth cold. It is interesting to note in this connection the similarity between the human being and the blast furnace. A furnace

From a discussion of Walter Mathesius' paper presented at the New York meeting of the American Iron and Steel Institute, May 25-26. The author, Henry P. Howland, is with the Wisconsin Steel Co., South Chicago, Ill.

with hot top and a cold hearth is exactly in the same need of treatment as a man with a hot head and cold feet; in other words, we have the well-known term—a sick furnace. The treatment consists in getting the furnace hearth hot, either by using hotter air blast or additional coke, or better still, a better quality of coke. To quote Mr. Mathesius, "the limit to which this direct reduction can be carried on depends on the ability to offset the resultant heat deficit in the hearth by higher blast temperature." I would state this differently, by placing more emphasis upon the quality of coke. In other words, unless we have a coke of good quality, it is practically useless to attempt to supply the heat loss, due to direct reduction by the application of high blast heats.

Mr. Mathesius illustrates the value of his theories in general and the application of high blast heats in particular, by citing the remarkable record made at South Works for the year 1916—over 2,000,000 tons of iron with an average coke consumption of 1,854 pounds of coke per ton of iron—certainly a most wonderfully remarkable record.

At the plant of the Wisconsin Steel Works we have a furnace which has given remarkable results, though on lower blast heats. It is the work of this furnace that has convinced me of the supreme value of a highly combustible coke.

Production Records

The furnace was blown-in in August, 1914; the production is as follows:

	Gross tons.
Monthly average	17,300
Year—1915	221,700
Year—1916	208,100
To May 1, 1917.....	553,000

The coke per ton of iron to May 1, 1917, as actually charged to the furnace, based upon railroad scale weights at the ovens several hundred miles away, is 1,703 pounds. Included in this is about 3 per cent screened out at the pockets, but this amount was nevertheless charged to the furnace. As ably pointed out previously by Mr. Mathesius, the prime qualifications of a good coke are its ability to resist the destructive action of CO_2 in the top of the furnace and its ability to burn instantaneously in the hearth. It so happens that these two requirements are diametrically opposed. All the coke burned by air in the hearth is first burned to CO_2, but immediately broken up into CO by the reaction $CO_2 + C = 2CO$, due to the intense heat of the hearth. In other words, for a good coke we require one which as it works its way down through the furnace will refuse to have anything to do with CO_2, but when it finally reaches the hot hearth, it will immediately be consumed by CO_2. However, this is the kind of coke we have been producing at many of our coke plants in the past few years.

The advance in blast furnace practice in recent years is, undoubtedly, due to available coke conforming to the requirements stated above and to better furnace lines, which contribute heavily to ideal operation.

The Case-Hardening of Iron by Boron

BY PROFESSOR TSCHISCHEWSKY

AN INSPECTION of photomicrographs of iron-boron alloys will show that on cooling these alloys the boron is not wholly combined in the form of borides of iron, but a proportion of it is left in the form of a hard solution. This phenomenon suggests the possibility of case-hardening steel by boron, similarly to the case-hardening of iron as accomplished through the use of carbon.

Alloys of iron with boron are remarkably hard, so that they can scarcely be treated on an emery wheel. The technical application of case-hardening by boron suggests itself therefore as a feasible industrial operation.

A paper presented at the meeting of the Iron and Steel institute, May 4, 1917.

FIG. 1—BORIC-PEARLITE WITH TWIN-CRYSTAL STRUCTURE

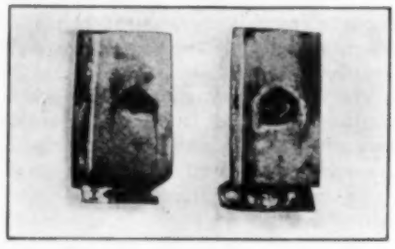


FIG. 2—CUBES OF IRON CONTAINING (I) AMORPHOUS BORON, AND (II) POWDERED FERRO-BORON

The complete cementation that takes place in carbon steel is not the type of operation the author has in mind, but a surface cementation. It is more convenient to obtain a ferroboric alloy by melting on account of the high price of boron, and also to secure its complete use without wastage.

The use of boron is not perhaps suitable for armor plates, because of its comparative scarcity, but for some machine parts and, generally speaking, where much wear occurs, boron can be applied with success. It must be pointed out that while annealing is necessary in order to confer the necessary hardness on articles case-hardened by carbon, boron confers hardness without the necessity of any special heat treatment.

To ascertain the conditions of case-hardening by boron, the author took a sample of iron of the following percentage composition: Carbon, 0.12; silicon, 0.02; manganese, 0.16; phosphorus, 0.06; sulphur, 0.04. And as a case-hardening powder, pure amorphous boron and a finely powdered rich alloy of iron with boron containing about 19 per cent of boron were taken.

The pieces of soft iron used were in the shape of cubes, holes being drilled in the center to a depth of about half their length. These holes were filled with fine amorphous boron, or with powdered ferroboron. The holes were closed by stoppers made from iron of the same quality, these stoppers being pressed home by means of a hydraulic press. The powder

FIG. 3—SUB-EUTECTIC ALLOY OF FERRITE-PEARLITE

being thus compressed, a good contact was secured between it and the sides of the sample, which was thus hermetically sealed. Specimens prepared by this method were heated in a Heraeus furnace in a silica tube. The temperature was measured by a Le Chatelier pyrometer, of which the thermo-junction was placed close to the specimen. In order to eliminate the influence of a gaseous medium, the whole of the air from the silica tube was removed by means of a mercury pump. The samples after heating during several hours, showed no trace of oxide on the surface.

Fig. 2 shows two samples which were heated for two hours at 950 degrees Cent. Specimen I contained amorphous boron and specimen II powdered ferroboron. Both samples were cut across longitudinally by means of a steel saw and the cut surfaces polished.

At the lower part of this illustration are seen the stoppers, which are sometimes marked with thin bands resulting from the contact with the cement powder left on their sides. The dark area over the stoppers represents the compressed cementing powder. The volumes of the compressed powders decrease partly on account of nodulizing, partly owing to absorption by the sides of the specimens. The bands represent an alloy of iron with carbon, and can clearly be seen in the vicinity of the spaces containing the compressed boron or ferroboron. Under the conditions of the experiment (950 degrees Cent and two hours' heating) the boron penetrated the iron to the depth of 1 millimeter.

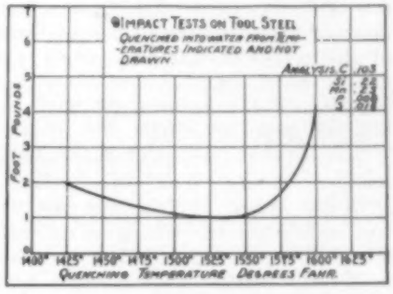
From the experiment it was ascertained that cementation by powdered ferroboron proceeds more easily and quickly than with amorphous boron. Microscopical examination shows that the hard white layer of the case-hardened part of the specimen consists of compact boric pearlite, with a twin crystal structure.

The photomicrograph of this portion is shown in Fig. 1. The edges of this layer contain a sub-eutectic alloy of ferrite-pearlite, as shown in Fig. 3. The ferrite in this instance contained the boron in hard solution.

Case-hardening at a lower temperature yields an alloy of iron containing less boron. This alloy is not so hard and brittle as that already described. In order to render the process of case-hardening by boron suitable for industrial purposes, it would be necessary to carry out a series of experiments on the conditions most suitable to the particular purpose in view.

Impact Testing Useful

In an address before the Steel Treating Research club of Detroit, H. J. Stagg Jr., metallurgist, Halcomb Steel Co., Syracuse, N. Y., outlined the interpretation of impact tests, their relation to Brinell, tension and torsion tests, and included a brief history of the impact method of testing. Impact testing has been surrounded by so many variables that it has never been found absolutely and entirely practicable for structural materials. Taken in connection with other methods, it is of value.


IMPACT TESTS ON TOOL STEEL
QUENCHED INTO WATER FROM TEMPERATURES INDICATED AND NOT DRAWN.
ANALYSIS C .103
FOOT POUNDS
1400° 1425° 1450° 1475° 1500° 1525° 1550° 1575° 1600° 1625°
QUENCHING TEMPERATURE DEGREES FAHR.

PLOT SHOWING IMPACT TEST ON TOOL STEEL

In general, there are three types of impact testing machines in use today, and the many tests carried out by various workers do not appear to indicate a marked superiority in any one of the methods. Each type of machine is used or championed by some investigators. The fact that no standard has been adopted has rendered the correlation of existing data extremely difficult and indefinite, and it is indeed almost impossible to translate the figures of one worker into those of another.

Any impact number corresponding to certain physical properties developed by a certain heat treatment in one steel compared with the impact number obtained in a different steel does not usually represent the existence of the same physical properties in the other steel. In other words, there appears to be no uniform relation existing between static tensile and notched-bar impact tests.

On this page, a plot of tool steel, containing 1.03 per cent carbon, quenched in water at different temperatures, is shown. The resistance to impact of tool steels, which are hardened and not drawn, is extremely small, as the diagram indicates—the ordinate figures covering the small range of from zero to seven foot-pounds. The curve shows a straight line at the correct hardening temperatures and decreases perceptibly up to 1,550 degrees Fahr. At 1,550 degrees, a marked and unmistakable change in the slope takes place, and the resistance to impact, strange to say, increases. Isolated impact tests used alone are misleading, but when employed to supplement data obtained by other methods of testing, they give extremely useful and valuable information.

The production of chrome iron ore in Southern Rhodesia (South Africa) in 1916 aggregated 88,871 tons valued at $1,621,365, compared with 60,581 tons valued at $855,490 produced in 1915.

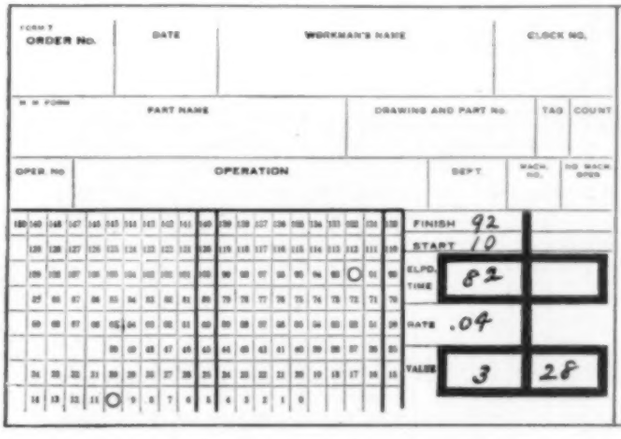


FIG. 1—FRONT SIDE OF TIME TICKET

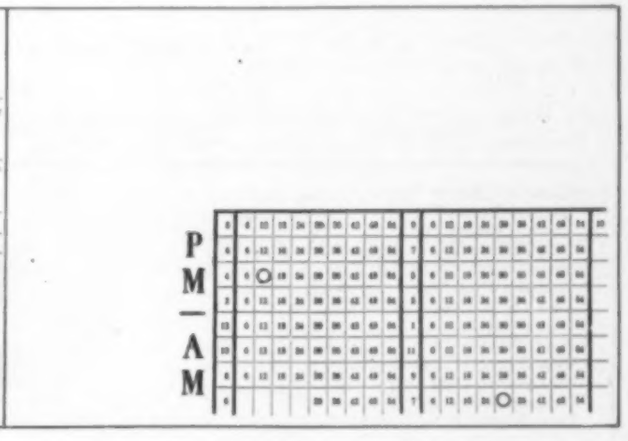


FIG. 2—REVERSE SIDE OF TIME TICKET

A Study of Fuel Oils From Coal

The Use of Internal Combustion Engines is Making Heavy Inroads on Petroleum Supplies of the World—Coal Distillation is a Source of Fuel Which is Being Investigated Carefully

BY HAROLD MOORE

FUELS have become the object of recent scientific study particularly because it is extremely important that a substitute be found for petroleum products. Since the outbreak of the war the fuel problem has come more into the foreground, and if, in any way, it were possible to provide a supply for only a small proportion of the fuel oil consumed, it would be a most desirable attainment from the viewpoint of national economics.

Shale oil has been found to be a satisfactory substitute for petroleum, but unfortunately, the output of this product is not sufficiently large to make any serious impression on the fuel market. The output of shale oil in the crude state in Scotland is less than 300,000 tons per year; the United States production for 1913 was 33,000,000 tons. Animal and vegetable oils are scarce and are of too much value for other industrial purposes to find their way on to the fuel market, where large quantities and low prices are essential. Peat oils do not give any indication of entering into the field in the near future, though the quantities of peat available are sufficient to warrant optimism.

The Products of Coal Distillation

Coal is an important factor as a source of liquid fuels. Coal, when carbonized, yields coke, gas, and tar, the latter under old systems, being the least important product. The amount of tar produced is dependent on the nature of the coal, and upon the temperature and design of the vessel in which the carbonization takes place. The older plants may be divided into two classes—gas and coke processes, depending upon whether the gas or the coke is the product for the production of which the plant has been specially designed. The horizontal retort is still the most common form of gas plant, in use in England, though on the continent the vertical retort is preponderant. Inclined retorts are employed in small numbers in both British and continental gas works.

Among the processes designed for the production of a coke suitable for metallurgical purposes, considerable variation of detail exists, and the products are affected both in quality and in quantity to some extent by the details of oven design. The chamber oven process is designed for carbonizing large charges of coal, and yields liquid products differing considerably from those given off by other types of ovens. Some of the coke-oven tars are suitable for use in diesel engines; others are unsuitable. The chamber oven tars are, however, generally suitable.

On distillation, tars yield their volatile portions in the form of distillates, while the heavier hydrocarbons and the free carbon are left behind in the still. The distillates are divided into fractions by the tar distiller, and are either sold or further purified. The lighter fractions command high prices for various industrial purposes, while the residue is unsuited for use in internal-combustion engines. The fraction known as creosote is, however, suitable for use in diesel engines. This fraction is also used for timber preservation, and out of production of 65,000,000 gallons to 70,000,000 gallons per annum, Great Britain exported before the war 28,000,000 gallons for this purpose, while the greater part of the remaining oil is used for timber preservation in Great Britain.

The Composition of Tar Oils

From these figures it will be seen that there is little opportunity for coal tar oils to become used in quantity for the production of power unless the output be considerably increased. Previous to the outbreak of war, there was little difference in price between tar oils and petroleum products, and even at times when prices were most favorable to the use of tar oil, there was little advantage to be gained by employing it when the lower calorific value of this product had been taken into consideration. Heavy oil engines have been designed to run on petroleum oil, and in order to obtain satisfactory running at all loads, it is necessary to adopt an additional fuel pump and special atomizing device to allow the use of an ignition oil. This means an increase in capital expenditure. The ignition oil in this case enters the cylinder prior to the main fuel charge, igniting and helping the combustion of the latter product. The necessity of making special provision for the burning of tar oils can be explained by the chemical composition. Tar oils consist mainly of aromatic hydrocarbons. It has been found by experiments that bodies of aromatic structure are more stable, under conditions of high temperature, and that they require a greater heat to cause them to ignite. This difference was found to approximate 150 degrees

From a paper recently presented before the Manchester Association of Engineers, Manchester, England.

Analyses of Fuel Oils

Table I

Description.	Sp. Gr. at 15°C.	Water	Ultimate Composition. C.	H.	O. & N.	S.	Ash	Coke	Net Calorific Value Calories	B. T. U.	Free Carbon
Horizontal Retort Tar	1·180	1·75	91·5	5·2	2·6	0·5	0·20	24·0	8,645	15,561	18·2
Inclined Retort Tar	1·157	1·13	89·9	6·0	3·6	0·5	0·02	18·5	8,671	15,626	14·0
Vertical Retort Tar	1·089	2·25	88·0	6·8	3·8	0·6	0·03	6·1	8,664	15,613	1·7
Otto Hilgenstock Coke Oven Tar	1·208	6·00	90·0	5·4	3·8	0·8	0·02	26·8	8,624	15,523	23·9
Simon-Carvé Coke Oven Tar	1·090	0·50	88·1	5·6	6·1	0·2	0·07	6·0	9,261	16,670	traces
Chamber Oven Tar	1·082	1·29	88·2	6·9	4·6	0·3	traces	7·3	8,737	15,727	3·0
Low Temp. Carbonisation Tar	1·058	3·00	85·8	8·1	5·49	0·09	0·11	8·2	8,776	15,795	2·2
Water Gas Tar	1·054	0·59	92·2	6·8	0·4	0·6	traces	18·7	8,647	15,563	6·8
Blast Furnace Tar	1·172	3·0	89·5	5·75	0·55	0·84	0·36	23·4	8,288	14,918	9·5
Blast Furnace Tar Oil	0·974	none	87·25	9·8	2·59	0·36	none	1·05	9,243	16,637	none
Oil Distilled from Low Temp. Tar	0·881	none	85·6	11·4	2·48	0·4	none	0·84	9,558	17,204	none
Horizontal Retort Tar Oil	1·065	1·0	90·1	6·8	2·4	0·50	0·2	3·0	9,243	16,637	none
Pensylvanian Petroleum Fuel Oil	0·889	none	86·7	12·55	0·11	0·64	traces	0·60	10,108	18,194	none

Cent. between tar oils and crude petroleum.

The oils derived from low-temperature carbonization processes, have not yet made their appearance on the fuel market, but though higher in calorific value than the normal tar oils, there is no reason to expect any reduction in price in the tar oil prices. The costs of such oils are to a large extent, due to the expense of transporting the tar to some central distillery and the oil from the distillery to the buyer. It becomes evident that if a cheap fuel is to be derived from coal the tar must be used before the operation of distilling has increased its price.

Using Raw Tar

Raw tars are at present obtainable for about $7.50 a ton, about half the price of the distilled product. The heavy tars yield on distillation only about 25 per cent of their weight in the form of tar oil, from which figure we can deduce that there will be about four times the quantity of fuel available if the raw product be employed. Tar possesses calorific powers about 16 per cent lower than average petroleum oils, which is little lower than the corresponding values of their distillates. In point of economy, tars afford ideal fuels in a country possessing no petroleum resources, and a copious supply of coal. There are, however, difficulties met with in burning tar oils.

When the shortage became acute, diesel engine manufacturers turned their attention to tar oils as likely substitutes. Research in this line resulted in the invention of the ignition oil pump. This, in turn, resulted in drawing up specificatons to insure a satisfactory quality of tar oils for use in diesel engines. The ignition oil was generally either a heavy distillate of petroleum or crude petroleum, both of these products igniting at comparatively low temperatures.

The successful running of tar oils led to experiments with raw tars, the result being that diesel engines were found to give quite satisfactory running on vertical retort tar, a product which is available in large quantities where these retorts are in general use for the production of lighting gas. Attempts were then made to run engines of the constant-pressure type on inclined retort, horizontal retort, and coke-oven tars. It was concluded after exhaustive tests that vertical retort tars, chamber oven tars, water gas tars, oil gas tars, and certain coke-oven tars were suitable for use in diesel engines, providing special adaptions were used. The tars obtained from horizontal retorts and inclined retorts were considered unsuitable. Lignite tar products were classed as suitable for use without any changes in the engine.

A careful examination of the literature which has been published on this subject in Germany and Switzerland, together with a large amount of experimental work both in the chemical laboratory and on the engines of the experimental department of Mirrlees, Bickerton & Day, have led the author to come to the conclusions shown in Table I regarding the properties required in tars to permit their use in diesel engines.

Suitable Market Vital

It is improbable that the gas companies will adopt the low-temperature type of plant on account of the low yield of gas, but they might be run on a small scale to enrich gas of low luminosity, as the gaseous products of the low-temperature plants are of very high candle-power if not stripped of any of their condensable contents. It has been pointed out that these processes might be used for the generation of electricity by using the coke in producers, and mixing the gas from the retort with the producer gas, then burning the result in gas engines, in which case tar and ammonia would be by-products. The coke obtained by the low-temperature processes has been claimed to be suitable for metallurgical purposes, but there appears little likelihood of finding a successful field for its use in this direction. As no process of carbonization of coal can be successful without obtaining a suitable market for all the products, it is necessary to find some use for the coke and gas. The ammonia will, of course, find its way to the usual fields.

Disposition of Low-Temperature Coke

The yield of gas being small, it will probably be washed for motor spirits and then burned under the retort. The satisfactory disposal of the coke is a much more difficult problem. If a suitable organization for the sale of the coke to householders existed, there is little doubt that the problem of its disposal could be solved in this way, as the low temperature coke is more easy to ignite than the other types of coke, and forms an excellent smokeless fuel for household use. There is also the possibility of using this coke in producers, where it should form a good substitute for anthracite. It would also be suitable for use under boilers, but the price would have to be low in order to compete with low-grade coals.

The yield of liquid products from the low-temperature carbonization of coal varies with the type of coal used. When coal containing a large percentage of volatiles is used, the processes yield large quantities of tar. It is only from this type of coal that any great advantage in the use of this method of carbonization appears possible. The Premier Tarless Fuel Co., working a plant at 900 degrees to 1,000 degrees Fahr. under a vacuum of 25 inches of

Desirable Properties of Tars

Table II

A high-hydrogen content is desirable; it indicates the presence of aliphatic hydrocarbons, facilitates ignition, and minimizes carbonization inside the engine. In considering the nature of flame yielded by the combustion of a low-hydrogen hydrocarbon, for example, acetylene or benzine (both of which contain 92 per cent carbon and 8 per cent hydrogen) both give very sooty flames.

A low "free carbon" content is essential, as the greatest difficulty is experienced in obtaining complete combustion and a clear exhaust when fuels rich in substance are in use. The free carbon is a precipitate of fine amorphous carbon containing nitrogen and oxygen, and may be considered as coke dust in an exceedingly fine state of division. The effect of free carbon on the engine is to cause wear on the piston rings, valves and cylinders, and generally reduce efficiency of the engine.

A high calorific power is always preferable, as upon this value is dependent the amount of work obtainable from unit weight coal.

A moderately low viscosity is preferable, as the oil must be sufficiently mobile or thin to flow through the engine service pipes in cold weather. Low viscosity also enables a more effective pulverization, thus increasing the thermal efficiency.

The fuel must contain less than 2 per cent water. When water is present in larger quantities it will cause irregular running and misfiring, and may produce more serious results.

The coking value should be as low as possible, never over 15 per cent, as this value is a direct measure of the tendency to form deposits in the engine.

The ash content must not exceed 0.15 per cent.

mercury, obtained the following average yields of tar:

Coal.	Tar Yield.
Cannel (poor)	52 to 60 gallons per ton
Cannel (good)	60 to 80 gallons per ton
Slack	20 to 25 gallons per ton

Specific gravity of tar 1.060.

There is another possible solution to the fuel oil question which has not yet been approached, and which is applicable to all types of carbonizing plants, namely the fractional condensation of tars. Though this method has, from time to time, been suggested as a means of helping the fractionization of the tar, or to some extent to avoid its distillation, it has not been widely discussed as a means of obtaining coal-derived liquid fuels.

The principle of fractional condensation is that the hot gases containing condensable products should, on leaving the retort where the carbonization has taken place, be cooled in stages so that the less volatile shall be condensed first and the more volatile products condensed in later stages. This appears to be a cheap and economical way of obtaining ideal fuel oils.

Beehive Coke Production Sets Record

The production of beehive coke in 1916 was the greatest ever recorded in the United States, and the average value per ton was higher than in any previous year. The official figures for 1916, just published by the United States geological survey, show that 35,464,224 tons of beehive coke, valued at $95,468,127, were produced last year, an amount differing by less than 1 per cent from the preliminary estimates of C. E. Lesher, of the geological survey, published on Jan. 1, 1917. The output in 1916 represented an increase over 1915 of 7,955,969 tons, or 29 per cent, in quantity, and $38,522,584, or nearly 68 per cent, in value. The average value per ton of the coal used in making beehive coke in 1916 was $1.26, an increase of 21 cents, or 20 per cent, and the average value of the coke was $2.69, an increase of 62 cents, or 30 per cent.

The number of active beehive ovens in 1916 was 65,605, as against 48,985 in 1915. Abandoned ovens numbered an increase of 16,620. The number of idle ovens was 25,976, as against 44,125 in 1915. Abandoned ovens numbered 2,265, of which nearly 1,800 were in Pennsylvania and West Virginia. No new establishments and but 104 new beehive ovens at old works were reported to be under construction at the end of 1916, a low record compared with recent years.

New Society

Of Industrial Engineers Organized at Chicago May 28

The Society of Industrial Engineers, a national organization, whose members will be men and women who are industrial engineers and executives of commercial and industrial activity, was perfected in Chicago Saturday, May 28, and will be made a permanent organization in Washington, D. C., June 15.

Charles Buxton Going, for 20 years editor of *The Engineering Magazine*, New York, was chosen provisional president and pro tem chairman of the board of directors. This board, comprising 15 prominent men from various sections of the United States, includes:

Charles Buxton Going, New York; C. E. Knoeppel, industrial engineer, New York; Frank B. Gilbreth, industrial engineer, Providence, R. I.; E. C. Shaw, vice president, B. F. Goodrich Co., Akron, O.; Harrington Emerson, industrial engineer, New York; Charles Piez, president, Link-Belt Co., Chicago; Irving A. Berndt, manager betterment department, Joseph T. Ryerson & Son, Chicago; C. DeA. Babcock, production manager, H. H. Franklin Mfg. Co., Syracuse, N. Y.; Willard E. Hotchkiss, Dean Northwestern University school of commerce, Chicago; Dexter Kimball, Cornell University, Ithaca, N. Y.; Morris L. Cooke, industrial engineer, Philadelphia; C. Day, industrial engineer, Philadelphia; Herman Schneider, school of engineering, University of Cincinnati, O.

The services of the new organization, upon completion, will be tendered to the government through Howard E. Coffin, chairman of the advisory committee, Council of National Defense, and such other committees as can use the services of the Society of Industrial Engineers. Temporary headquarters are established at 327 South La Salle street, Chicago, in charge of G. C. Dent, temporary secretary.

According to the *Scientific American*, the increase of the munitions output of Great Britain between June, 1915, and December, 1916, as reported by the British ministry of munitions, is as follows: For every heavy howitzer produced then, 323 are produced now; for every field howitzer produced then, there are 46 produced now; and for every gun of medium size produced then, there are 66 now. The output of 60-pounders and 6-inch guns went up eighteenfold and has now dropped back to twelvefold, as the supply is too great. In a single day as many shells for heavy guns are made as were turned out during the whole first year of the war, and in a week the factories turn out as many shells for field howitzers and 3-inch field guns as were turned out in the first year of the war.

Coating on Tinned Copper Prevents Corrosion

"Structure of the Coating on Tinned Copper in Relation to a Specific Case of Corrosion", is the subject of a bulletin just issued by the bureau of standards, department of commerce, Washington, D. C. The author, Paul D. Merica, states that his attention was directed to a curious case of local corrosion or pitting in tinned sheet copper roofing. The pits occurred in general along the line of surface scratches, having appeared some eight or 10 years after the completion of the roof. These pits were apparently unrelated to the service conditions, and to the direction of rolling of the sheet. When the copper became exposed at the bottom of the scratches on the surface, it formed together with the alloy layer a galvanic couple, electrolytic action set in, and the copper at these points corroded, forming the pits described.

This bulletin, known as technologic paper No. 90, gives the results of a study on the structure of tin coatings on copper, and it is shown that this coating consists of at least three layers. The alloy layers are electronegative to both the tin and the copper base. The paper is now available for distribution and a copy may be obtained by addressing the bureau.

Philadelphia Foundrymen Discuss Alloys

Comparative advantages of 50 per cent ferrosilicon and 80 per cent ferromanganese were discussed by A. E. Outerbridge Jr., metallurgist, Wm. Sellers & Co., Inc., Philadelphia, at the 268th meeting of the Philadelphia Foundrymen's Association, Wednesday evening, June 6. Mr. Outerbridge also spoke of the problems attending the casting of metals in permanent molds. The talk on ferroalloys was illustrated by lantern slides.

The Pittsburgh Steel Products Co., Pittsburgh, is completing plans for the addition of two units to its seamless tube mill near Charleroi, Pa. Contracts for necessary equipment have been placed. The McClintic-Marshall Co. will erect the building.

Hammer vs. Press in Heavy Forging

An Interesting Description of the Invention and Development of the Steam Hammer and a Discussion of the Merits of Pressing, Rolling and Hammering Large Forgings

BY JOHN LYMAN COX

A FINISHED piece of wrought steel is the result of many operations performed upon it, each of which affects the final result to some extent, though not all to the same extent. Certain of these effects may be partially or wholly neutralized by subsequent operations. Others once produced cannot be obliterated but remain to modify the final physical properties of the metal. The principal conditions upon which the physical properties of steel depend are composition, process of melting, care in melting, design and character of ingot mold, conditions of pouring and of cooling, temperature and time of reheating, amount and character of hot working, finishing temperature, final section, subsequent treatment, and the manner of testing.

An ingot, as cast, possesses a coarse crystalline or granular structure, the size of the granules depending upon the composition, temperature of pouring, character of mold, method of cooling, and the time of cooling. The hotter the metal and the slower the cooling, the coarser will the structure be. Alloy steels seem to have a finer structure than plain carbon steel and high carbon finer than low. Under similar conditions, the larger the ingot the worse its structure will be; the more apt it is to have internal defects and greater damage results from cooling and heating it.

The function of hot working is twofold: To bring the ingot to the dimensions desired in the completed article and to break up the coarse structure of casting. The finer the final structure, the more tough and ductile will be the steel, other things being equal. This final fine-grained structure in turn is dependent on a proper heating, both as regards time and temperature, to break up the ingot structure, and upon a thorough working, during cooling, to complete this grain refinement.

The original power hammer was a crude affair compared with the mechanisms we now possess. It consisted of a beam hinged at one end and die at the other. At an intermediate point engaging cams on a revolving shaft alternately raised the free end and allowed it to fall on a bottom die fixed upon a foundation. Swinging in the arc of a circle, the top die could never be parallel to the bottom die except in one position. The larger the piece to be forged the less the power that was available to forge it, a defect common to all hammers, yet partially overcome today by the use of top steam.

This was the situation in 1839 when no one in England could be found to forge the 30-inch iron paddle shafts designed for the steamer GREAT BRITAIN. In his autobiography, James Nasmyth, of Manchester, England, then engaged in the manufacture of machine tools, describes these conditions. He writes that he described a steam actuated hammer to several parties as the solution of the shaft problem, but that none was ordered or built because the propulsion of the vessel was changed from paddle to screw, and because there followed a dullness

The author of this paper, John Lyman Cox, of the Midvale Steel Co., presented it at the New York meeting of the American Iron and Steel institute, May 25 and 26.

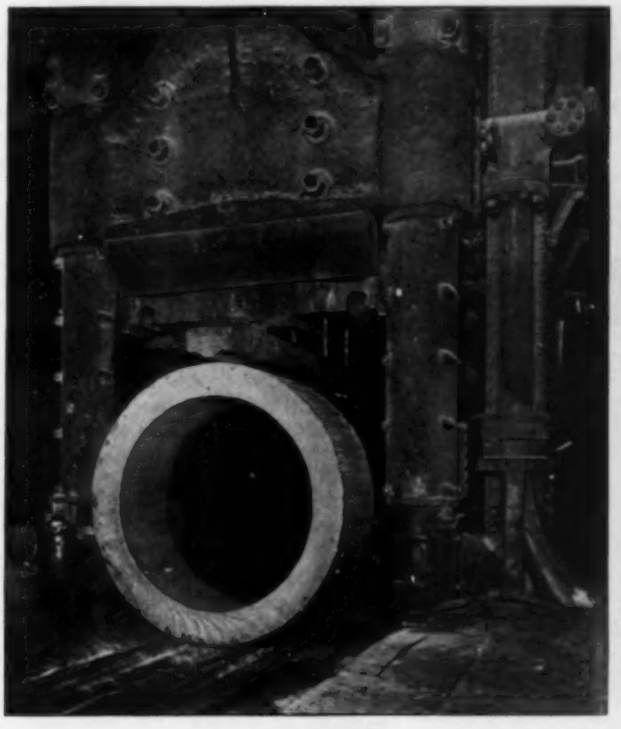


FIG. 1—10,000-TON PRESS OF BETHLEHEM STEEL CO.

FIG. 2—WHITWORTH FORGING PRESS FOR HEAVY GUN WORK

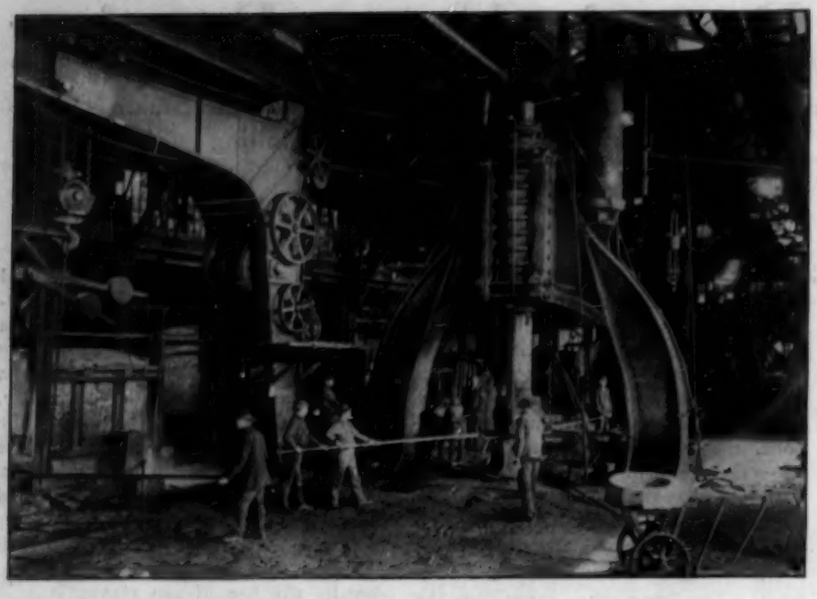


FIG. 3—10-TON DOUBLE ACTING STEAM HAMMER

in the iron trade. On one occasion when he was absent, his partner, Mr. Gaskill, showed to M. Schneider, owner of the great steel works at Creusot in France, and to his able engineer, M. Bourdon, a drawing of the steam hammer. M. Bourdon took careful notes and sketches of its constructive details.

In 1842, Mr. Nasmyth visited M. Bourdon at Creusot, and there found that a steam hammer had been constructed for his drawings. He made suggestions for a few refinements, which when carried out by M. Bourdon, greatly improved the hammer.

In April, 1842, my father, the late James G. Cox, of Philadelphia, then just 20 years old, was visiting M. Bourdon at Creusot. One day, during this visit, M. Bourdon asked my father if he had ever seen a steam hammer. On being told that he had never heard of such a tool, M. Bourdon took him into the works, where, surrounded by many precautions, a steam hammer was running. Much impressed by what he saw, my father asked and received permission to copy the drawings of this tool. The place and date of the invention are given on it as Creusot, 1841.

Bringing Hammers to America

One day M. Bourdon explained the operation of the hammer to James Nasmyth. That night at dinner Mr. Schneider, who had been absent during the day, asked M. Bourdon whether there had been any guests that day at the works. On being told, "Yes, Mr. Nasmyth of England," Mr. Schneider started up, saying, "You did not show him the steam hammer, did you?"

M. Bourdon replied, "Yes," whereupon Schneider struck the table a blow with his fist, exclaiming, "By Heaven, he'll patent it in England tonight."

Mr. Nasmyth returned to England and, according to his autobiography, immediately took out patents on the steam hammer, the United States agency for which he thereupon offered to my father. This flattering offer my father declined through loyalty to his friends, believing that Mr. Nasmyth was not entitled to the profits of the invention. Subsequently the American agency was given to Samuel Vaughan Herrick, Philadelphia, who accepted it with perfect propriety and to whom it proved most profitable.

Owing to its power being derived from the inertia of the falling mass, the steam hammer has least power when it most needs it, on large diameters, and vice versa. The need of power on large diameters is twofold: The forging must be worked to its center to break up ingot structure, as well as to prevent grain growth, and large diameters involve large die contact areas with corresponding pressures. In 1882, when the Midvale Steel Co. took its first order for 6-inch navy rifles, its forge shop was equipped with Morrison type hammers, the largest being a 10-ton double-acting hammer with 35-inch steam cylinder and a 6½-foot stroke.

The tubes were made from 25-inch octagon ingots reduced to 13-inch rounds, tapered to 11 inches at the muzzle. The jackets were made from 30-inch squares reduced to about 17½-inch rounds. For these operations the hammer had sufficient power, although the cogging of a 30-inch square to a 20-inch octagon was a slow process. In 1885, the company took an order for a short 8-inch rifle for the army, the jacket of which had to come from a 38-inch octagon. The increase of 8-inch overstepped the boundary. Although in time the gun was finished, the 38-inch ingot was clearly beyond the proper range of the 10-ton hammer.

With the increase in the size of naval guns a heavier tool became necessary and in 1888 the Midvale Steel Co. began the erection of a 25-ton, double-acting hammer with 50-inch cylinder and 9½-foot stroke. This hammer was built by the Morgan Engineering Co. from designs by the late Frederick W. Taylor. This tool was probably the most effective hammer ever built. The forging was controlled entirely by power. The ingot was brought from its heating

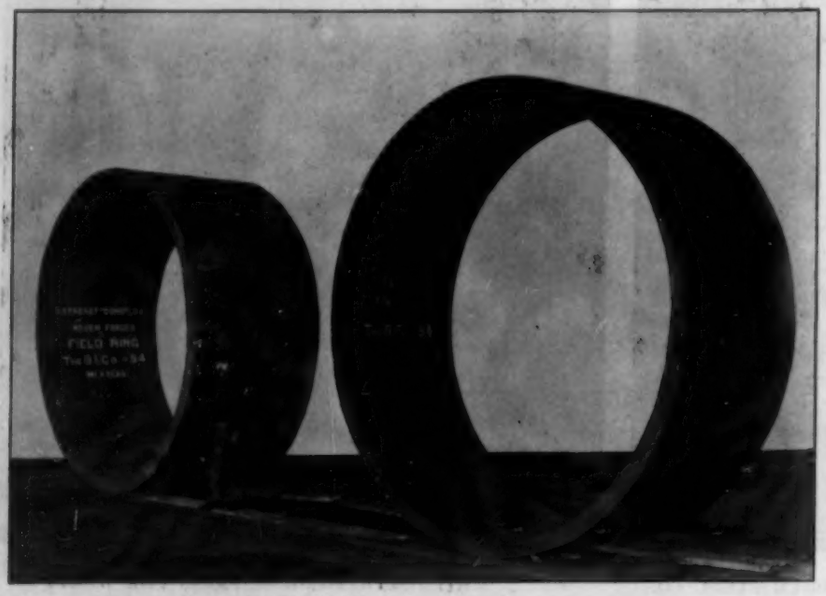


FIG. 4—NICKEL STEEL FIELD RINGS FOR DYNAMOS

furnace to the hammer with the free end of its porter-bar fastened to a trolley in an underground conduit. When the ingot was landed on the die, the trolley was disconnected and on the porter-bar was thrown a heavy ring connected by a wire rope to a horizontal underground hydraulic cylinder which did all the weighing-on of the usual crowd of men. The 60-ton traveling forge crane rotated the piece on the die and the overhang was sustained at first by a gantry, later by a 25-ton traveling crane.

With this powerful tool 13-inch gun forgings were made in quantities from ingots as large as 63-inch octagon, in spite of predictions to the contrary, and with excellent results.

Largest Steam Hammer

The largest hammer ever built was the 125-ton single-acting hammer of the Bethlehem Steel Co., intended for the forging of armor plate. Both it and the 25-ton double-acting hammer of Midvale, really a 75-ton as compared with a single-acting hammer, have been abandoned for forging presses.

In 1861, Manassah Gledhill, of Manchester, England, invented the forging press. Mr. Gledhill was at first an employe and later an associate of Sir Joseph Whitworth, by whose name the press became known. For many years this wonderful machine was used secretly in the Whitworth shops, and so far as I am aware it was not until 1887 that it was sold for outside use and was brought to this country by the Bethlehem Iron Co.

Cogging Ingots

In cogging down an ingot under a hammer, before rounding up begins, several blows are usually struck in the same spot until fear of lapping stops them. Due to the inertia of the part of the ingot beyond the die, at the instant the blow falls there is a tendency to cock up the end of the piece and as there is no ready means of taking out this short kink, except by turning the piece upside down, the tendency is to let it occur and for the hammer die to cut in more deeply on one side of the ingot than the other, gradually throwing the axis of the forging out of the axis of the ingot. This does not occur under a press. There the tendency is for the live die to cut in a little deeper than the dead die and bend the piece down; but the piece is revolved after every impression, which tends to keep it straight, and as the movement of the press is comparatively slow, the cranes lower in unison with it. If the forging becomes bent, if not too stiff, it can be straightened by one of them pulling up while the pressure is on, or by running up the forging carriages and straightening the piece between them.

FIG. 5—HANDLING LARGE GUN FORGING UNDER PRESS

Forging Pressures

The lowest forging pressure per square inch of die contact area of which I know as being effective was 1.2 tons per square inch, with which it was possible to edge in an ingot 90 inches wide at a full forging heat, and from this the pressure runs up to 13¼ tons per square inch, which it takes to completely fill the sharp corners of molds for steel wheels.

Thinking that it would be of interest and possibly of value to make some experiments along these lines, I had prepared a series of 18 blocks of steel of the following compositions: Carbon, 0.40; manganese, 0.455; phosphorus, 0.064; sulphur, 0.062; and silicon, 0.131. These blocks were rough-turned 11⅛ inches in diameter and cut to lengths of 2, 4, 6, 8, 10 and 12 inches, one of each length in a set, there being three sets in all. All the blocks of each set were heated in a furnace to as nearly as possible the same temperature, the first set to 1550 degrees Fahr., the second set to 1700, the third to 1850. The lowest temperature selected was chosen as a common though rather high finishing temperature for forgings, the highest an example of bad practice and the intermediate a mean. Of course, at a full forging heat of from 2200 degrees to 2300 degrees Fahr., far more would have been accomplished than at the temperatures of the experiment. What was deemed ample time was allowed for the pieces to reach and soak out at the specified tempera-

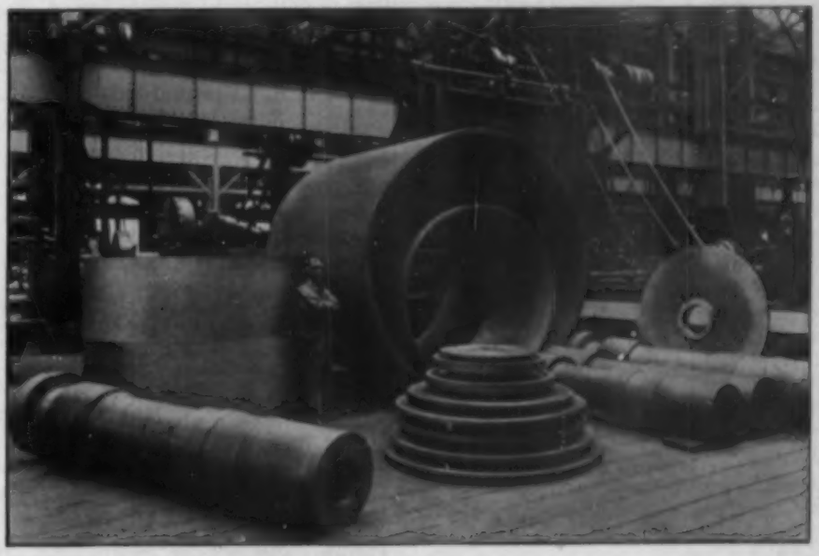


FIG. 6—TYPICAL WORK PERFORMED ON HEAVY FORGING PRESS

tures, which are probably correct within about 50 degrees. In every case but one this time seems to have been sufficient. As rapidly as possible the pieces were carried by hand from the furnace to the 16½-inch diameter plain dies of a 500-ton steam-hydraulic forging press and there subjected at once to the full pressure of the tool. The lowest recorded pressure per square inch of ram was 4850 pounds, the highest 6250 pounds. With from 5.6 tons to 6.2 tons per square inch of contact area or median line there was practically no flow of metal in a 2-inch piece at temperatures between 1550 degrees and 1850 degrees Fahr., and that the amount of flow increased rapidly with increase of thickness and increase of temperature. Calculated on the final contact areas of the dies and corrected for variations in hydraulic pressure, the lowest contact pressure obtained was 3.57 tons per square inch and the lowest final medium pressure 2.00 tons, measured on a 12-inch piece. These results show that on plain dies and for thin flats, to successfully forge steel at the temperature chosen pressures much higher than 6 tons will be required.

Disadvantages of Presses

The advantage of absence of shock, in addition to the weight to be handled in forging such masses of steel as shown here can be readily appreciated by everyone, yet in spite of its adaptability to a wider variety of work, even such as hot-planing the defects from heavy armor plate, the press has two failings, both due to its lack of impact. First, it is harder to get rid of scale; second, it cannot strike in a mold as large a forging as a hammer its equivalent in other respects. In our experience we consider a 500-ton press the equivalent of a 2¼-ton hammer, a 1200-ton press the equivalent of a 10-ton hammer, a 2500-ton press the equivalent of a 25-ton hammer; yet a 4½-ton hammer can make drop forgings which are beyond the power of a 1200-ton press, and a 2¼-ton hammer can about equal it.

To institute a comparison between the effects of rolling and the effects of hammering or pressing is much more difficult than to compare with each other the effects of the two latter methods. Each has wide fields of application with fairly well defined boundaries, yet there is a neutral zone in which both operate. Heavy plates are produced both by the press and mill, billets and medium-sized rounds, squares and flats, by all three instrumentalities, and small regular sections of tool steel by the hammer and the mill.

The tendency of rolling is to have

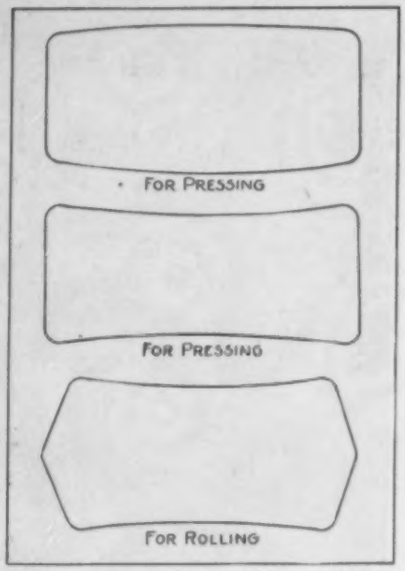


FIG. 7—CROSS SECTION OF ARMOR PLATE INGOT

a more superficial action than either hammering or pressing; thus to avoid excessive loss through fishtailing the sides of armor plates there is often made a distinct difference between the cross section of the ingot mold for rolling into armor plate and the section used for pressing into the same plate. Under a press the sides of the straight-sided ingot bulge slightly outwards at points about halfway between the center line and each face, but remain nearly straight; between the rolls the center of the diamond-sided ingot stretches very slightly in width, but the upper and lower surfaces run out along the rolls, producing approximately straight sides in the finished plate. A straight-sided ingot would

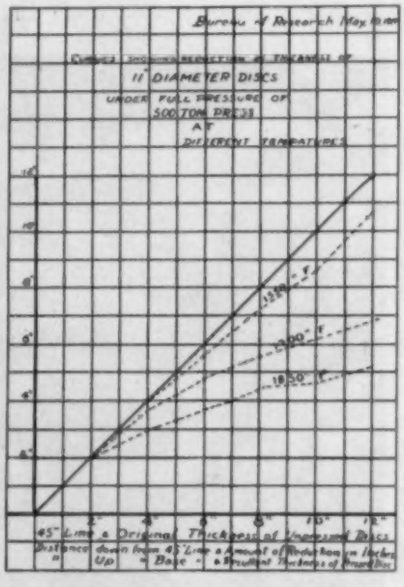


FIG. 8 — CURVES OF REDUCTION OF THICKNESS OF DISCS AT DIFFERENT TEMPERATURES

make a concave-sided plate, if not one actually lapped.

The three points just considered constitute, I believe, the reasons for the common inferiority of rolled products. If a heavy mill were to roll its products from ingots at a low initial rolling temperature and finish them at the same temperature as material laid down from a press or hammer, I believe that the difference between rolled and forged products would largely disappear.

In this country all except the thinnest armor plates are pressed, but in Europe, where the demands for armor are sufficiently great to warrant investment in a machine capable of the great output of a mill, armor plates are frequently rolled. Enormous mills for this work exist in a number of public and private establiments, both in England and on the Continent. At one English works, certainly until recently, the custom was to rough out the plates under a press, cut off the scrap and finish them by rolling.

Novel Time Cards for Costs

The Midland Machine Co., Detroit, is using a novel time card in connection with its cost system. As is usual, the manufacturing requisition is placed with the production department, and the cost sheet is made out. Time ticket, as shown on page 1293 in Figs. 1 and 2, are made out, stamped with the order number and part number. A card file carries the different job numbers on tab cards, and as fast as the time tickets and material requisitions are turned in, they are placed in this file. When the job is completed, the time for the different operations is taken from these time tickets and entered on the cost sheet, and in this way the total is observed.

The reverse side of the time card, shown in Fig. 2, is divided into hours, and tenths of an hour. The front side of the card is divided into numbers representing units of six minutes each. When the starting time is punched, say 7:30 a. m., as shown on the card, the punch registers 10 on the front side of the card, as may be found by turning the card over. In like manner, when the workman is through with the job he is on, the time at which he stops can also be punched. In the illustration, the job was completed at 4:12 p. m., which indicates 92 on the front side of the card. The number of units worked show up then without any figuring, in this case 82.

A unit of 6 minutes is valued at 4c for a certain operation, so that 82 units have a value of $3.28, as the ticket shows.

British Bar Iron and Steel Exports

Government Extends Restrictions to Include Practically All Important Rolled Products —Not Being Strictly Enforced—Welsh Tin Plate Makers Want American Orders—Fuel Shortages Trouble Furnaces and Mills

Bureau of The Iron Trade Review,
Prince's Chambers, Corporation St.,
Birmingham, Eng., June 1, 1917.

SELLING restrictions have been increased by a new order in council issued a few days ago greatly extending the list of prohibitions of exports of iron and steel. The list now covers iron and steel articles containing chrome, cobalt, molybdenum, nickel, tungsten or vanadium; iron angles, channels, joists, tees and other sectional material; iron bars, including flats, rounds, and other sections and shapes; iron billets, blooms and slabs; iron bridgework, pier work and structural material; iron hoops and strips; iron ingots; wrought iron pipes; iron plates and sheets; iron sheet bars, and iron tubes. Steel and steel articles containing chrome, cobalt, nickel, or vanadium; steel bars, including flats, rounds and other sections and shapes; steel plates and sheets and rails, sleepers, springs and other railway structural material are prohibited to all destinations.

The list is a very comprehensive one, practically covering all iron and steel products to all foreign destinations. It is reported, however, that the order is not being enforced, and the authorities are credited with the intention of imposing further reduction on overseas business, without extinguishing it. Various obstacles still are opposed to large production. The black country is very unfortunate just now in its fuel supply. One of the worst cases reported is that of a large black country company which, to economize railway transit, was directed to get its coal from the nearest pits. It happened that this coal was very unsatisfactory and the scarcity of labor did not enable screening and sorting to be done. The coal has failed to heat up the iron, and eventually the proprietors shut down the works and appealed to the ministry of munitions. Representatives of this authority promptly condemned the supply and reviewed the arrangements, so that there is now a somewhat better prospect of the works making reasonably full time.

The dilution of labor causes increasing concern. Recruiting colonels in their zeal are visiting a number of works and urging managers to accept substitutes from discharged soldiers, or rejected men not quite equal to army requirements. Managers have a poor opinion of the suitability of these men, and are impressing upon the government that unless an absolute famine of iron is to be faced, workmen must not be further interfered with. Demand for puddled bars far exceeds capacity. The supplies of this material are being restricted solely to former customers. For every description of finished iron, there is a very large demand. The Scotch steel mills are as busy as they can be and additional plant is gradually being brought into operation. The mills are concentrating on steel angles and plates for merchant boats, and the government is taking nearly all the output.

Want American Tin Plate Orders

Prices of tin plates still are on the upgrade, although British production continues to decrease. Last week only 6,000 boxes were turned out. A large number of the tin plate workers have migrated to iron and steel works in Derbyshire and the north of England. In the tin plate business there is an idea that the entry of the United States into the field may have an important bearing on the tin plate business. A report has reached this country that, while the United States requires 7,500,000,000 tin cans for packing goods, only 4,000,000,000 can be furnished by American mills. The Welsh tin plate makers are hoping that they may get a share of the orders for the balance of tin plate needed, or realize a portion of the business hitherto done by America with neutral markets. There is the possibility that our government may not encourage increased manufacture of Welsh tin plates, in view of the great demand for raw steel for other purposes, as well as of the shortage of labor in the mills. An advance has been made in mild steel wire of £5 ($24) per ton. This follows a rise of £3 ($14.80) in January last. The production of this material is much less than the demand.

The minister of Munitions is taking an exceptionally long time to consider the application for higher prices of pig iron. Nothing definite has yet been heard, but it is reported that the investigation of the books and working costs, initiated a fortnight ago, now is completed, and an answer almost immediately is looked for. In the meantime a good deal of new booking is being got through. Manufacturers are not seeking orders, especially as their position has been strengthened by the turning on of various furnaces to the production of basic. The government means to have larger quantities of this material, and it is likely that other furnaces will be transferred to this grade. All stocks are being cleared out, and there are no weak places in the market. With several Derbyshire furnaces now making basic, neighboring Northampton material has attained a position of strength not realized for many months past. At the meeting in Birmingham yesterday, a good deal of offered business from eager buyers was declined by smelters, who, as a rule, do not accept more than half the tonnage offered. In spite of the delay smelters speak confidently of being allowed an advance of 5s or 10s a ton. Consumption of high-grade foundry iron by the heavy shops producing rolls and mill equipment generally is phenomenal.

In the Middlesbrough district the tone continues strong with firm prices at the official maximum. Buyers would like to place substantial forward orders, but manufacturers prefer small parcels and the business becomes increasingly a regular supply of material to meet the needs of consumers, on the basis of their monthly allocations of business. Some re-arrangement of the railway traffic has enabled a better use to be made of the wagons available, so that deliveries from Cleveland to the Midlands and Scotland are fairly substantial. A less proportion of the iron made is going abroad which is somewhat to the advantage of the home consumer. Hematite quotations continue unchanged at 122s 6d ($29.40) to home consumers; at 137s 6d ($28.20) to France; and at 142s 6d ($34.20) to Italy. There is very little iron to offer, as demand still is in excess of conusmption.

Everything still is being done to increase the number of active furnaces. A remarkable re-start of a furnace was made at an iron works near Barrow a week ago. After standing 12 years, the furnace has resumed on steelmaking iron. As it is the largest of the four furnaces held by the company, it will turn out 2000 tons per week. Other furnaces are being rebuilt, so that the capacity of the district shortly will be much in-

creased. Blast furnace managers are very much concerned with the fuel question, which is once more rather troublesome, and it is quite possible that some drastic steps will have to be taken before the heavy autumn demand commences. The colliery owners themselves state unhesitatingly that the eight-hour act will have to be suspended if the requisite amount of fuel is to be obtained. But it may be taken for granted that this will be opposed by the Miners' Federation and colliers generally.

We have a disturbing and regrettable strike of engineers, initiated and persisted in in defiance of the recognized leaders and advisers. It is not impossible that the long period of nervous and physical strain may have had something to do with the outbreak. It is not, however, taken too seriously, and there are signs that next week there may be a general resumption of work.

New Company

Will Sell Steel in Pacific Northwest Through Direct Mill Connections

The Hilton-Pike-Oakley Co., 1812 L. C. Smith building, Seattle, recently has been incorporated in Washington for the purpose of selling a full line of iron and steel products on the north Pacific coast. The material will be furnished by direct mill connections in the east. The officers of the new company include A. A. Hilton, Seattle, president; C. W. Pike, 22 Battery street, San Francisco, vice president; A. G. Oakley, Seattle, vice president; and L. A. Landis, Seattle, secretary and treasurer. Messrs. Hilton, Pike and Oakley have been engaged in the sale of iron and steel products for a number of years, and the formation of the Hilton-Pike-Oakley Co. represents an extension of the activities of established interests rather than the formation of a new company.

A. A. Hilton, the president of the new company, has been on the Pacific coast since 1904. For a number of years he was manager of the Tacoma plant of the Griffin Wheel Co., Chicago, and prior to that time he was prominently identified with the car wheel and foundry industries of the central west. C. W. Pike was born in California and has been direct mill representative of a number of large eastern iron and steel producers for a number of years. He will continue to operate the business of the C. W. Pike Co., San Francisco, just as Mr. Hilton will continue at the head of the A. A. Hilton Co., Seattle. A. G. Oakley, who has been on the Pacific coast for several years, was formerly connected with the sales department of the Cambria Steel Co., at Philadelphia. Prior to his association with Mr. Hilton a couple of years ago, he was with the Hofius Steel & Equipment Co., Seattle. L. A. Landis, secretary and treasurer of the new company, has been associated with Mr. Hilton in the sale of iron and steel products for a number of years.

The Hilton-Pike-Oakley Co. will act as direct mill representative for the sale of refined iron and steel bars, sheared and universal plates for marine and structural purposes, structural and marine shapes, bolts, nuts, rivets, pipe bands, billets, blooms, ingots, forgings, sheet mill products, railway supplies, etc.

Will Build Engines

The Scranton Foundry & Engine Works, Inc., New York City, has acquired the former plant of the Touhill Iron Works at Hickory and Mattes streets, Scranton, Pa. The company was recently incorporated with a nominal capitalization of $100,000 to build marine engines of from 500 to 2,500-horsepower and to make gray iron castings. The plant is comprised of four good-sized buildings, several smaller structures, with a ground space of seven acres. Officers are: President, M. J. O'Shaughnessy; vice president, Hiram Dixon; treasurer, E. V. Davis; secretary, Roger Brassell. The New York office is at 5 Nassau street.

Enlarges Machine Output

Sleeper & Hartley, Inc., designer and builder of automatic wire coiling machinery, Worcester, Mass., has leased a portion of the building formerly occupied by the L. D. Thayer Mfg. Co., 47 Lagrange street, in that city, for the purpose of extending its manufacturing plant. It intends to develop that part of the business dealing with the making of nail machinery upon a much larger scale, and will put in a considerable amount of equipment in the new shop. The main factory will be continued at 68 Prescott street.

The Spring City Bloom Works, Pottstown, Pa., which was purchased several months ago by the Parkesburg Iron Co., has resumed operations on double-term after having been idle for several years.

Obituaries

JAMES P. McKINNEY, president of the McKinney Mfg. Co., Pittsburgh, died at his home in that city, June 5, aged 69. With his brother, W. S. McKinney, Mr. McKinney founded the McKinney Mfg. Co. of Cincinnati. Subsequently the company moved its works to Hamilton, O., and in 1878 the concern went to Pittsburgh. Mr. McKinney was a director of the Niles-Bement-Pond Co., New York. He was born in Troy, N. Y. He served in the Civil war.

Albert H. Collins, contracting engineer for the General Fire Extinguisher Co., Providence, R. I., died June 6 at his home in Brooklyn, aged 54.

Moritz Eyssell, of St. Louis, Mo., died at his home there May 31. He was general manager of the Fairview Fluorspar Lead Co. at Golconda, Ill.

John Henderson of Henderson Bros., Waterbury, Conn., manufacturers of tumbling barrels, died May 15.

James Pender, managing director of the James Pender Co., nail and wire manufacturer, and one of the most prominent business men of St. John, N. B., died May 30.

Charles J. Moulton, several years eastern manager of the Sims Feed Water Heater & Machinery Co., Erie, Pa., died recently at South Beach, N. J., aged 44.

William A. Stevenson, for 27 years general manager of the Norwood Engineering Co., Northampton, Mass., was found dead in bed from heart disease at his home in Florence, Mass., June 7, aged 57 years.

George B. Fritzius, 79 years, a pioneer wire manufacturer, died at his home in North Braddock, Pa., June 1. He was one of the incorporators of the Pittsburgh Wire Co., Braddock, with which he was connected until it was absorbed by the United States Steel Corporation.

W. W. Green, president of the Garden City Fan Co., Chicago, died at his home in Niles, Mich., June 2. Mr. Green was born at Williamston, Mass., Dec. 9, 1838, but in 1872 moved to Chicago and established the plant of which he was president many years. In 1902 the works were moved to Niles, Mich.

Institute Formed

By Manufacturers of Nuts, Bolts and Rivets on Eddy Plan

The Nut, Bolt and Rivet Institute, recently organized by 37 manufacturers, has established headquarters in the Oliver building, Pittsburgh. The society will not consider prices, except as matters of history. Officers are: President, N. J. Clarke, Upson Nut Co., Cleveland; vice president, M. L. Comly, Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.; treasurer, N. T. Jones, Foster Bolt & Nut Co., Cleveland; secretary, Charles M. Best, Oliver building, Pittsburgh. Members of the executive committee are: N. J. Clarke, M. L. Comly, N. T. Jones, R. W. Gillespie, Bethlehem Steel Co., South Bethlehem, Pa.; D. J. Champion, Champion Rivet Co., Cleveland; W. G. Costin, Pittsburgh Screw & Bolt Co., Pittsburgh; C. W. Scofield, Lake Erie Iron Co., Cleveland. Arthur J. Eddy will act as counsel.

Awarding Contracts For New Texas Plant

Beaumont, Tex., June 9.—Colonel L. P. Featherstone of Beaumont, president of the Texas Steel Co., who is now in the east placing additional contracts for the construction of blast furnaces and other departments of the iron and steel plant that is to be built here, has announced that the new industry will be ready for operation in about eight months. While in Washington a few days ago, Colonel Featherstone had a conference with Gen. George W. Goethals and members of the United States shipping board at which he stated that his company would ask for a contract covering the construction of 22 vessels, to be built according to government specifications and under government supervision. The proposed work is to be completed within six years. The iron ore for the new iron and steel plant will be obtained from the mines of the company in East Texas.

Machinery Men to Hold Export Convention

Metals day will be observed Thursday, June 29, at the first industrial exposition and export conference in Springfield, Mass., which opens Saturday, June 23, and continues through June 30. The presiding officer will be Charles E. Hildreth, president and general manager of the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., and general manager of the National Machine Tool Builders' association. The subjects for discussion are: "After the War—What of Machinery Export?", speaker to be announced later; "American Tools in Foreign Markets", Oren O. Gallup, New York, export manager of the Simonds Mfg. Co., Fitchburg, Mass.; "Metal Fittings in Overseas Markets", Adolph W. Gilbert, Chapman Valve Mfg. Co., Springfield, Mass. Col. George Pope, president of the National Association of Manufacturers, New York, will preside at the afternoon session, June 29, and W. W. Nichols of the Allis-Chalmers Mfg. Co., New York, at the evening conference on the same date.

Will Dedicate

McKinley Memorial Oct. 5—Engravings of Ex-President Are Offered

October 5 has been fixed as the date for the dedication of the national McKinley memorial and for the unveiling of the marble statue of Ex-president McKinley at Niles, O. Ex-President William H. Taft will deliver the principal address. The memorial building is practically completed and the statue will be finished some time in July. The National McKinley Birthplace Memorial association, of which J. G. Butler Jr., Youngstown, is president, has had prepared a mezzo-tint engraving of McKinley, by Frederick Reynolds, of New York, which is being offered for subscription to all the admirers and friends of the Ex-president. The engraving is of the very finest workmanship and is one of the best likenesses of Major McKinley. It can be obtained both in signed and unsigned artist proofs, but there is only a limited edition of both. Subscription to one of the engravings carries with it a life membership in the National McKinley Birthplace Memorial association.

Pushing New Works

Work is progressing rapidly at the new Worth Bros. plant at Claymont, Del. Structural work for the main building is in position, while construction of the first furnace is about completed. The company plans to have the plant operating about Oct. 1. Hamilton Evans, formerly superintendent of the steel plant, and E. C. Jones, formerly general superintendent of labor with the old Worth plant at Coatesville, will be identified with the Claymont organization, commencing June 15. Both men are veterans in the steelmaking industry.

First Decline

In Several Months Shown by Steel Corporation Tonnage

New York, June 9.—For the first time in four months, the unfilled orders on the books of the United States Steel Corporation for May show a shrinkage. The total unfilled bookings as of May 31 was 11,886,591 tons, a falling off of 296,492 tons or 2.43 per cent compared with the April tonnage. This shrinkage not only reflects the Steel Corporation's efforts to reduce the tremendous tonnage on its books, but the attitude of the steel industry generally to conserve its capacity for government war requirements.

Comparison with the unfilled tonnages of previous months follows:

Date	Total	Change, tonnage	Change, per cent
May 31, 1917..	11,886,591	296,492—	2.43—
Apr. 30, 1917..	12,183,083	471,439+	4.02+
Mar. 31, 1917..	11,711,644	134,947+	1.16+
Feb. 28, 1917..	11,576,697	102,643+	0.90+
Jan. 31, 1917..	11,474,054	73,232—	0.64—
Dec. 31, 1916..	11,547,286	488,744+	4.43+
Nov. 30, 1916..	11,058,542	1,043,282+	10.41+
Oct. 31, 1916..	10,015,260	492,676+	5.18+
Sep. 30, 1916..	9,522,584	137,133—	1.42—
Aug. 31, 1916..	9,660,357	66,765+	.69+
July 31, 1916..	9,593,592	46,866—	0.48—
June 30, 1916..	9,640,458	297,340—	3.09—
May 31, 1916..	9,937,798	108,247+	1.11+
Apr. 30, 1916..	9,829,551	498,550+	5.34+

Will Advise Advertisers of Metal Industry

A. A. Gray and Charles L. Benjamin have organized the firm of Gray & Benjamin, with headquarters in the Transportation building, Chicago, and will serve as advertising counsel to manufacturers of electrical, mechanical, chemical and kindred products. They will analyze and report upon problems of manufacture and distribution and will supervise the preparation of advertising copy for technical and trade papers, booklets, house-organs, catalogs and incidental advertising propaganda. Mr. Gray was managing editor of the *Electrical Review and Western Electrician* for many years and also served a term as president of the Federation of Trade Press associations, and more recently was president of the Associated Business Papers, Inc. Mr. Benjamin has been engaged in advertising work since 1888. For a period of nine years, he was advertising manager of the Cutler-Hammer Mfg. Co., Milwaukee, and for the past two years he has engaged in advertising work on his own account, acting as advertising counsel to a number of manufacturers of nationally known products.

Steel Exports Decline in April

Steel Bars Practically Only Product to Show Substantial Gain—Pig Iron Drops 25,000 Tons—Scrap Exports Slump Sharply After March High Record While Imports Increase

STEEL bars were conspicuous among iron and steel exports for April, 1917, showing one of the few substantial increases of the entire list of products. Steel bar exports for April, 1917, totaled 73,346 tons, against 58,251 tons for the corresponding period of last year and 52,366 tons for last month. Sheets and plates followed steel bars in a somewhat desultory way, showing an export tonnage of 67,559 for April, 1917, as compared with 62,711 tons for March, 1917, and 38,611 tons for April, 1916.

IRON ORE IMPORTS, GROSS TONS

	April, 1917	April, 1916	Ten m'ths end'g April, 1917	Ten m'ths end'g April, 1916
Spain	24,943	*	199,582	63,610
Sweden	1,022	22,232	128,358	181,539
Canada	128	480	87,871	84,343
Cuba	31,625	53,000	551,545	685,399
Oth. countries	1,160	*	60,994	128,073
Total				

*Not shown.

Pig iron, for foreign shipment showed a marked decrease. A total of 44,783 tons were exported during April, 1917, a decrease of approximately 25,000 tons over the preceding month. In comparison with the corresponding month of last year, however, the tonnage displayed an increase of about 150 per per cent. A remarkable fluctuation in exported pig iron has characterized the market during the past 10 months. This has varied from 15,061 tons during February, 1916, to 105,195 tons in December, 1916. April figures are about the average of the 10-month period.

EXPORTS, GROSS TONS.

1916.	Pig iron.	Semi-finished material.
Jan.	18,719	55,315
Feb.	15,061	87,306
Mar.	19,439	107,696
Apr.	18,518	88,764
May	28,293	142,782
June	48,770	116,425
July	28,718	135,827
Aug.	60,264	160,921
Sep.	64,122	163,104
Oct.	101,756	162,679
Nov.	102,786	125,038
Dec.	105,195	162,901
1917.		
Jan.	69,146	183,656
Feb.	49,018	131,566
Mar.	69,629	193,469
Apr.	44,783	174,039

After striking a crest of 38,506 tons in March, 1917, scrap, during April, 1917, with an export figure of 12,966, showed a decrease of approximately 66 per cent. Scrap though, has maintained its normal export tonnage, if compared with figures obtained by striking an average for the past year.

Exports of iron, steel and manufactured products of these metals totaled $102,560,345 for April, 1917, a decrease of approximately $10,000,000 from the preceding month, but still stupendously large and exceeding last year's total for the corresponding month by 100 per cent. A summation of the value of iron, steel and their allied products exported during the past 10 months is expressed by $903,106,411.

Importations of iron and steel during April, 1917, were little changed over May. They were valued at $2,322,455 and exceeded March, 1917, by scarcely $200,000. Imports for April, 1917, show a slight increase over the valuation of $2,079,169 for April, 1916. An interesting feature of the April report is the stimulated imports of scrap. These totaled 34,681 tons as compared with 26,809 tons for the preceding month and exceeded the tonnage of April, 1916, by 500 per cent.

IRON AND STEEL EXPORTS, GROSS TONS

	April, 1917	April, 1916	Ten months end'g April, 1917	Ten months end'g April, 1916
Scrap	12,966	15,975	216,527	113,953
Pig iron	44,783	18,518	690,412	209,665
Steel billets, ing. & bl'ms	162,209	88,764	1,577,205	702,999
Wire rods	11,830	14,556	114,459	137,798
Steel rails	38,410	22,346	513,076	443,197
Steel bars	73,346	58,251	635,306	486,926
Iron bars	3,467	5,178	50,804	57,075
Struc. iron and steel	26,431	20,019	285,207	221,956
Hoops, bands and scroll	3,471	2,665	35,807	33,963
Sh'ts & plates	67,559	38,611	509,663	403,522
Tin & terne plate	19,910	21,495	184,178	175,244
Barbed wire	13,726	27,750	277,249	287,603
All oth. wire	16,426	20,408	200,545	198,515
Cut nails	323	178	3,883	3,439
Wire nails	6,968	10,850	104,691	99,271
All oth. nails incl. tacks.	1,805	633	15,217	7,821
C. I., & W. I. pipes & fit'gs	11,962	12,413	202,909	143,174
R. R. spikes	813	2,939	15,500	22,229
Bolts, nuts, rivets and washers	2,074	2,264	24,483	26,193
Horseshoes	460	516	3,704	10,526
Cast radiators	458	123	3,226	1,972
Total	519,397	384,452	5,664,091	3,787,041

Machinery exports for April were $21,939,582, as compared with $17,526,899 for the same month of 1916. The total value of all machinery exported during the 10-month period ending April, 1917, reached $211,442,800. Metal working machinery in April amounted to $6,250,728, compared with $6,552,397 in April, 1916. Agricultural implements evidenced a substantial increase and exportations were $403,814, against $102,855 in April, 1916. Motor truck exports were valued at $2,416,368 compared with $5,259,480 in April, 1916. Total exports of motor trucks for the 10-month period were $36,157,941 against $48,897,162 for that ending April, 1916. April exports of steam locomotives were $2,273,801, and electric locomotives were valued at only $9050. The total valuation of exported railway cars, including passenger and all other types was $2,283,813 for April, 1917. Exports of cars during April, 1916, were $2,022,214, and for the 10-month period ending April, 1917, $20,721,372.

IRON AND STEEL IMPORTS, GROSS TONS.

	April, 1917	April, 1916	Ten m'ths end'g April, 1917	Ten m'ths end'g April, 1916
Scrap	34,681	6,116	191,864	85,737
Pig iron	8,771	8,680	107,445	94,224
Steel ingots, bl'ms and billets	3,930	3,208	19,431	16,905
Wire rods	*	303	2,063	3,693
Rails	577	438	11,606	40,037
Bar iron	60	956	4,208	6,081
Structural	63	140	793	1,238
Sheets & plates	97	157	1,483	1,467
Tin and terne plate	34	179	608	673
Total	48,213	20,177	339,501	250,055

IMPORTS AND EXPORTS, GROSS TONS.

1915.	Imports.	Exports.
July	20,858	380,340
August	27,556	405,850
September	23,345	382,113
October	34,318	349,843
November	37,131	362,764
December	35,408	353,853
1916.		
January	15,824	354,416
February	20,279	368,869
March	15,159	438,054
April	20,176	384,917
May	32,114	540,580
June	26,786	526,759
July	14,729	503,187
August	32,257	597,739
September	25,559	643,762
October	30,169	610,110
November	42,545	554,856
December	44,134	580,957
1917.		
January	40,192	608,105
February	24,379	449,099
March	37,280	606,559
April	48,213	519,397

The Crucible Steel Company of America, Pittsburgh, is adding four stationary open-hearth furnaces, one tilting furnace and one electric furnace to its Park Works, Pittsburgh. A new building, involving 2,000 tons of steel, will be erected by the McClintic-Marshall Co., Pittsburgh.

The Wharton Steel Co. is about to pump out its Hibernia mine near Rockaway, N. J.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

FRANKLIN B. RICHARDS, a member of the firm of M. A. Hanna & Co., Cleveland, has been commissioned captain of ordnance in the officers' reserve corps. He probably will be stationed at Washington, where his thorough knowledge of the iron and steel industry will be found invaluable in connection with the providing of ammunition for the army.

George J. Baldwin has been elected to the board of the American International Corporation, New York.

Joseph W. Flavelle, chairman of the Imperial Munitions Board of Ottawa, Canada, has been knighted by King George in recognition of his services.

Robert Craig will sever his connection with the Union Mfg. Co., New Britain, Conn., to take a position as production manager with the Lenoir Car Wheel Foundry Co., Lenoir City, Tenn.

George O. Andrews, Hartford, Conn., has taken a position with the George P. Clark Co., Windsor Locks, Conn., maker of hand and elevated trucks, as assistant general manager and sales manager.

C. M. Carmichael, who has been assistant works manager of the Anniston Steel Co., Anniston Ala., has accepted a position as superintendent of the British Forgings Co., Toronto, Ont.

Edwin E. Arnold, for two years chief engineer of the New Departure Mfg. Co., Bristol, Conn., has resigned to become vice president and general manager of the Iron City Products Co., Pittsburgh, Pa.

C. A. Newman, previously with Henion & Hubbell, Chicago, as manager of sales promotion, now is sales manager of the Boiler-Kote Co., with general sales offices in the Fisher building, Chicago.

Hugh McGann, former assistant superintendent of the Cuyahoga mill of the American Steel & Wire Co., Cleveland, has been made a lieutenant of the marines and will leave soon for Port Royal, S. C., preparatory to active service.

W. B. Ferguson, for the past three years production and efficiency engineer at the plants of the Remington Arms & Ammuition Co., Bridgeport, Conn., is to resign about June 15 to enter the government service as an assistant to Maj. Gen. George W. Goethals in the construction of ships. For several years Mr. Ferguson was superintendent of construction in the New York navy yard.

W. W. Hall, who recently resigned as Pittsburgh manager of the Republic Iron & Steel Co., Youngstown, to become identified with the Columbia Steel & Shafting Co., Pittsburgh, has been made assistant general manager of that company.

Andrew Carnegie has arrived at Shadow Brook, Lenox, Mass., in the private car of Charles M. Schwab, where he is to pass the summer and autumn. He was accompanied by his family, his physician, nurses and attendants.

I. W. Rouzer, formerly general executive of the Atlanta, Birmingham & Atlantic railroad is now manager of the traffic department of the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., a newly created department of that company.

T. N. McEuen has been appointed representative of the E. J. Woodison Co., Detroit, manufacturer of foundry and platers' supplies, in the states of Iowa and Nebraska. Mr. McEuen formerly was attached to the Milwaukee office of this company.

Samuel Knowlton Wellman, construction engineer with the Wellman-Seaver-Morgan Co., Cleveland, has been commissioned first lieutenant in the ordnance department of the officers reserve corps. He is a nephew of S. T. Wellman.

Dr. William O'Neil Sherman, chief surgeon, the Carnegie Steel Co., Pittsburgh, on June 1 conducted a clinic in the West Penn hospital, that city, to show the application of the Carrel treatment, the most successful antiseptic and healing agent yet used in the battle front in Europe.

Samuel B. Harding, a founder and former president of the Modern Steel Structural Co., Waukesha, Wis., now the Federal Bridge & Structural Co., has accepted an offer from the United States government to take charge of a large shipbuilding establishment and now is on duty.

Ernest C. Head, for many years chief designer and engineer of the Colburn Machine Tool Co., Oil City, Pa., has resigned. Mr. Head has acquired an interest in the Advance Mfg. Co., Toledo, O., and will devote his time to the interests of that company.

W. E. Hamilton, formerly works manager of the Anniston Steel Co., Anniston, Ala., is now supervising the building of a power plant at Fairmont, W. Va., which he will manage upon completion. W. E. Mitchell, lately operating manager of the Alabama Power Co., has succeeded Mr. Hamilton.

G. S. Evans, who recently resigned as superintendent of the foundry of the Lenoir Car Works, Lenoir City, Tenn., is engaged in the construction of a large steel and gray iron foundry and machine shop at Atlanta, Ga., and he will be placed in charge of the operations of this plant when it is completed.

Harry L. Horning, secretary and general manager of the Waukesha Motor Co., Waukesha, Wis., automobile, truck and tractor engines, has accepted an important post in the federal service as representative of the farm and ordnance tractor industry on a committee advisory to the national council of defense.

J. S. Fraser, superintendent of blast furnaces of the Pittsburgh Steel Co., has been appointed superintendent of furnaces and steel works, effective June 1. H. R. Shick has been made blast furnace superintendent, with Mr. Callaway as assistant. Mr. Shick formerly was assistant superintendent of furnaces.

J. C. Hoot, general purchasing agent for the Illinois Steel Co., Chicago, has resigned and will be succeeded by Charles H. Rhodes, formerly purchasing agent for the Ojibway plant of the United States Steel Corporation. Previous to that employment, he was the purchasing agent for the American Steel & Wire Co. at Pittsburgh.

M. A. Pollock, formerly assistant advertising manager of the Locomobile Co. of America, Bridgeport, Conn., has been appointed manager of the Bridgeport branch, and P. W. Hine, formerly in this position, succeeds Clinton B. Amorous as assistant sales manager. Mr. Amorous has resigned to accept a position with the Parish Mfg. Co., Detroit, Mich., as assistant to C. C. Ostrom, factory manager.

Discuss Steel Prices For Ship Plan

Negotiations Now Going Forward With Manufacturers For Approximately 1,000,000 Tons—Higher Prices Than For Navy Needs Expected—May Increase Number of Steel Vessels—Shake Up in Building Corporation

WASHINGTON, June 12.—Announcement is being withheld for the present by Maj. Gen. George W. Goethals, general manager of the emergency fleet corporation of the United States shipping board, as to whether or not prices have been determined upon for structural steel to be used in vessels to be built under the direction of the corporation. There are insistent reports that the prices have been fixed for the steel material, but neither confirmation nor denial of the reports has been made at the office of General Goethals. These reports also are to the effect that distribution of the steel will be left with a committee of the American Iron and Steel Institute. It may be, according to reports, that the same committee will assume this work as that having charge of the distribution of structural steel to the navy and war departments. It is expected that the settlement price will be considerably higher than the 2.90c for plates and 2.50c for shapes and bars fixed for the approximately 600,000 tons of navy and war department requirements for 1917 delivery.

Can Provide Material

Estimates have been unofficially made that the steel ship building program will call for something in excess of 1,000,000 tons of structural steel, of which approximately 600,000 will be plates and the remaining 400,000 tons or more will be shapes and bars. As has been stated heretofore General Goethals has been assured by steel producers that adequate supply of structural material can be furnished for the steel ship building program. This assurance, together with data that have been supplied to him as to the number of steel ships that can be fabricated in 18 months, is understood to have been the reason for General Goethals taking a firm stand in favor of the building of as many steel ships as possible, and to abandon the program of constructing 1000 wooden ships in that period, as was popularly supposed to be the original program of the board. There are members of the board, however, favorably inclined toward an extensive wooden ship building program, who, it is said, knew at the outset that the number of ships of that type mentioned could not be built in the time named. President Wilson himself, it is said, was long ago made aware of the fact that the plan would ultimately be found impossible of execution. This fact having been realized by General Goethals immediately after being made general manager of the emergency corporation, he is said to have become convinced of the necessity of planning at once for the building of steel ships to the greatest number possible. How deeply rooted the idea of building a vast number of wooden ships has become in the minds of attaches of the shipping board and the emergency corporation was indicated plainly by the statements given out last week by F. A. Eustis, assistant general manager of the corporation, and F. H. Clark, consulting engineers, which ran counter to General Goethals steel ship building program. The day immediately following the issuance of those statements General Goethals wrote a letter to Chairman Denman, discharging Mr. Eustis and Mr. Clark, although the former remains as special agent of the board. Rear Admiral H. H. Rosseau has been named as assistant manager of the corporation, while Samuel L. Fuller has been named to succeed Mr. Clark.

Government Bids Cover Many Products

Bids are to be taken soon by the Charleston Navy yard for three 6-ton electric furnaces for the production of refined steel.

On june 12 tenders were received for 800 tons of basic pig iron for the Washington Navy yard.

Bids are wanted June 25 by the Frankfort arsenal for the sale of 1000 net tons of iron and steel turnings, and for some tonnage of iron, steel, tin and other scrap material.

Frankfort arsenal will take bids until June 11 for 500 drill cartridges and for 75 sub-caliber cartridges for 3-inch field guns.

The bureau of yards and docks of the navy department took bids June 11 for the construction of caisson gates for dry docks at the Philadelphia and Norfolk navy yards, and for a 200-foot steel observation tower at Pensacola, Fla. On June 25 a shipbuilding dock for Puget sound is to be up for figures.

Expect Further Dissension

General Goethals, in his letter to Mr. Denman, charged both Mr. Eustis and Mr. Clark with "disloyalty and misstatement of fact". Chairman Denman disclaimed knowledge of the intention of Mr. Eustis or Mr. Clark to issue the statements, and said the dissension rested solely between them and General Goethals. There is a feeling, though, that Chairman Denman had considerable sympathy for the views expressed in the statements of Mr. Eustis and Mr. Clark. Because of this feeling, there are those who say it would not be cause for surprise if another row was not stirred up between Gen. Goethals and Mr. Denman, and possibly other members of the board. In such an event, it is believed, General Goethals would again come out victoriously, as he has done in the past two occasions, and with a shakeup in the board's membership resulting. The confidence not only of the public but also of congress in General Goethals apparently means he is firmly intrenched in his position, if he desires to remain in it. He would, it is insisted, resign before foregoing his ship building program as now outlined, with its policy of directing most of the building operations upon steel rather than wooden ships. Should an issue finally come up between General Goethals and members of the board, it does not seem unlikely that President Wilson would take charge of the situation, and despite the fact that the shipping board was really named by Secretary of the Treasury McAdoo, it is thought the President would urge General Goethals to continue in his position and compel members of the board not agreeing with General Goethals to resign.

May Increase Steel Ships

Coming from a source which is apparently reliably informed, it is reported to be the intention of General Goethals to have at least 2,000,000 tons of steel ships and approximately 1,000,000 tons of wooden ships built in 18 months, all upon a lump sum basis, rather than upon a basis of cost plus a certain percentage of profit. It is also said that steel fabricators and ship yards may find it possible to increase the contemplated output of steel ships. Of the 2,000,000 tons now in prospect in the time named, it has been stated that a group of independent shops will fabricate 200 vessels of 5000 tons each, or 1,000,000 tons in all, while the remaining 1,000,000 tons will consist of vessels of varying sizes, most of 4500 tons each, to be fabricated by the American Bridge Co., at its newly acquired assembling site in New Jersey, and by the Bethlehem Steel Corporation, at its Sparrows Point, Md., plant, and perhaps by other

companies. The steel ships, it is understood, will have a speed of 12 knots an hour, while the wooden vessels will have 10 knots.

Urges Heavy Loading

Washington, June 12.—Appeal made recently by the bureau of foreign and domestic commerce, department of commerce, to more than 7000 trade organizations urging maximum loading of freight cars has met with a gratifying spirit of co-operation, as indicated by replies being received by the bureau. Maximum loading of cars was urged in order to assist in reducing the car shortage and thereby release cars for important use. Attention is now being called to eliminating delays in unloading, which will likewise tend to release many cars.

Asking for the support of all persons and concerns, the special committee on national defense of the American Railway Association, the agency by which the railroads are co-operating to meet the emergency transportation needs of the government, in addition to the ordinary needs of the country, has issued a statement relating to the mobilization of the carriers. It is pointed out that there are 2,500,000 freight cars in the United States which is barely sufficient for commercial needs. The railroads in the near future will use 120,000 cars to transport material for the construction of the new army training camps, and many cars steadily to keep those camps in supplies. It is estimated that it will take 200,000 cars to carry the material which will enter into the construction of the government merchant ships, whether of steel or wood. An enormous number of cars will be required to move the steel for the ships under construction for the navy. No estimate can be made of the number of cars needed to carry the material used in the manufacture of munitions and supplies for the army and for the transportation of the finished product. Where lines were competing some of the trains are being and will be withdrawn. The number of trains for commuters will be reduced. At terminals all loaded cars may be sent over one line and the empties sent back over another.

Will Exploit Home Manganese Supply

Washington, June 12.—Appreciating the desirability of increasing the domestic output of manganese ore as much as possible, particularly under war conditions, plans in this direction are being made through the co-operation of federal and state authorities. F. W. DeWolf, state geologist of Illinois and president of the State Geologists' Association, and W. O. Hotchkiss, state geologist of Wisconsin, and secretary of that association, are in Washington conferring with representatives of the bureau of mines and the geological survey. One purpose is to co-ordinate the work being done by the states and the government so as to avoid duplication of effort and to increase the effectiveness of their work.

It has also been suggested that in order to insure the maximum production of ores of all grades, it is necessary that competent economic geologists, mining engineers and owners of manganese deposits co-operate. This suggestion is in accord with one made in a recent "war bulletin" prepared by D. F. Hewett, manganese specialists of the United States geological survey. It has been pointed out that as the manganese deposits of the United States have not yet been able to supply large quantities of ore in competition with several foreign sources, the operation of most domestic manganese mines has ceased to be profitable, and much of the annual output is derived from brief campaigns of operation by "optimistic investors who know little about the business and its risks." The mining of manganese ores therefore, it is maintained, does not appear to attract the able engineers and workmen who make a success of mining iron ore and coal in the same or nearby regions. The contention is made that it is not impossible that the production of high-grade manganese ore might be made profitable and be increased three or even six times if the owners of the mines had the benefit of competent technical advice and supervision.

While it is reassuring to know that even if Russia and Indian ores are largely eliminated, Brazil can supply the quantity of high-grade ore required by domestic steel manufacturers, the meager response of domestic manganese mines to prices that are three times normal, is held to be a source of apprehension. There is also known to be some anxiety as to the matter of getting a continuous flow of ore from Brazil. In this connection, it has reported that Germany is making efforts to establish a naval base at an island off the cost of Venezuela, and, while it is believed such an effort could be frustrated without great difficulty, nevertheless this government does not want to take any unnecessary risks.

Mr. Hewett in his bulletin says that the supply of high-grade manganese ore is deficient, but there is reason for expecting that if the low-grade manganiferous iron ore and materials of similar composition can be more widely utilized, an adequate supply of raw material can be obtained for several years at least.

"It is not clear," he continues, "what increase in price of manganese alloys would be necessary to bring forth the required supply, but it seems certain that the needs could be met by the combined output of manganiferous iron ore, manganiferous silver ore, and manganiferous zinc residuum."

The bulletin adds: "There can be little doubt that, under necessity, the manganese and maganiferous iron deposits of Virginia, Georgia, Tennessee and Arkansas can be made with little additional equipment to yield twice or three times the present output for several years. Undoubtedly, however, the deposits of the Cuyuna range, Minn., offer a greater supply in a smaller area.

"The recent increase in prices of alloy has diverted for the manufacture of spiegeleisen large quantities of manganiferous silver ores that previously had been used only as flux. Mines at Leadville, Colo., and Pioche, Nev., have shipped a large aggregate quantity and will probably continue to ship, but in such districts explorations are rarely carried on greatly in advance of production. Systematic investigation in Pioche, Leadville, and elsewhere may show that these districts contain large quantities of manganiferous siderate which may be smelted to spiegeleisen.

Suggest Increased Use of Spiegel

"The largest resources of manganiferous materials in the United States are those from which only spiegeleisen may be made by processes now in use. It would be well to inquire whether there is a prospect of making from such materials, by milling methods or preliminary smelting, a product rich enough in manganese to be smelted to ferromanganese.

"The problem of adequate manganese supply resolves itself into two parts—production, on the one hand, and utilization, on the other. Most manufacturers of steel are aware of the conditions that affect the current supplies of manganese ores and alloys, but it is possible that they have not adequately considered the prospect of utilizing other manganiferous ores."

Will Push Production of Railroad Equipment

Washington, June 12.—Exceptionally heavy demands by the allies for American railroad supplies has caused the council of national defense to name two co-operative committees whose duties it will be to speed up the production of cars and locomotives. These committees will serve with the committee on transportation and communication, of which Daniel Willard, chairman of the advisory commission of the council, is chairman. S. M. Vauclain, vice president of the Baldwin Locomotive Works, is chairman of the two committees: The other members follow:

Co-operative committee on cars—E. F. Carry, president Haskell & Barker Co.; Charles S. Gawthrop, vice president American Car & Foundry Co.; Clive Runnels, vice president The Pullman Co.; R. L. Gordon, assistant to president Standard Steel Car Co.; A. S. Reeder, vice president Pressed Steel Car Co.; S. P. Bush, president Buckeye Steel Casting Co.

Co-operative committee on locomotives—Andrew Fletcher, president American Locomotive Co.; H. P. Ayres, vice president H. K. Porter Locomotive Co.; Joel Coffin, chairman Lima Locomotive Corp.

Plans for the purchase, upon the recommendation of the council of national defense of 100,000 freight cars are under consideration, according to Chairman Vauclain. Mr. Vauclain said the plans are still in a formative stage. Car builders of the country, it is reported, are coming to Washington soon to discuss the question with the defense council. The cars would be of a large type, and would cost approximately $150,000,000. The senate recently rejected a bill offered by Senator Hoke Smith of Georgia, for the purchase by the government of 100,000 freight cars. It is said the plans of the council are in no way connected with the proposed legislation of Senator Smith.

Government Will Build Many Great Shops

Washington, June 11.—War demands have caused the undertaking by the navy department of a tremendous building program for the improvements and extensions of navy yards, gun shops, training and aviation stations, dry docks, storage warehouses and other buildings. This construction involves an expenditure of about $80,000,000.

Some of the work is notable as to size. A new gun shop being erected at the naval gun factory at Washington will be the largest of its kind in the world and will cost about $2,000,000. The total expenditures at the naval gun factory will foot up $7,000,000. At the New York navy yard, a storehouse which will be the largest single building of its kind in the country, is under construction, as well as the doubling of the machine shops and the erection of new structural and other shops, representing an outlay of $5,000,000. The largest foundry on the Atlantic coast is being built at the League island navy yard, Philadelphia. The other improvements at this yard include a new dry dock 1000 feet long capable of accommodating the largest ships, two new shipways, new structural machine and pattern shops and other buildings. The expenditure will be about $18,000,000. At Norfolk, $20,000,000 is being expended for a 1000-foot dry dock, new structural machine shops, foundry and other improvements. The Mare Island yard is being equipped to build the largest types of battleships, and at Puget Sound, Wash., $3,000,000 is being expended to provide facilities for building cruisers and various auxiliary vessels. A new aviation station has been constructed at Pensacola, Fla., with hangars, dirigible shed and other buildings. Various improvements have been made at the Portsmouth navy yard, at Newport, Boston, New Orleans and other points. Work is going forward on the new base at Pearl Harbor and on a 1000-foot dry dock.

The new navy shops will produce guns, torpedoes, mines and optical instruments, besides projectiles and powder. The shop equipment will be unusual. Traveling cranes up to 300 tons and fitting cranes up to nearly 400 tons will be installed.

Working to Obtain More Liberal Ferro Supply

Washington, June 12. — Willingness having been signified by the British government to turn over to the department of commerce of the United States the matter of making an equitable allotment of pig tin in this country, it is considered probable that a similar arrangement will be made by that department with the British government with regard to distributing ferromanganese to domestic manufacturers. At a meeting of representatives of the tin plate industry and bureau officials, held in Washington June 6 it was desided to ask the American Iron and Steel institute to call a meeting to form an organization to handle the distribution of tin shipments. A similar organization from the institute, it is believed, will be named at the request of the bureau of foreign and domestic commerce for distributing ferromanganese imports. The bureau still is negotiating with Great Britain to release larger quantities of ferromanganese with bright prospects, it is said, of success.

Following a meeting held in Pittsburgh last week between a representative of the bureau and tin plate manufacturers, the department of commerce announced that the producers showed good results had been attained in furnishing plate to tin can manufacturers. The tin plate makers said that by August 1 they will be in a position to supply tin plate in quantities sufficient to meet all demands.

In a formal statement, the department added:

"The total consumption in base boxes of tin plate averaging 100 pounds each, in 1916 was 18,147,439. Of this 14,755,242 boxes were for perishables and 3,392,197 for nonperishables. Each box of 100 pounds makes approximately 333 cans of ordinary size.

"The estimate for 1917, on June 1 is for 24,108,976 base boxes of 100 pounds each, and of this number 4,472,126 are for nonperishable products and 19,636,850 for perishable food."

Adopt Standardized Truck Equipment for Army

Washington, June 12.—Announcement has been made by the Society of Automobile Engineers, following a two-day conference here with army officers and members of the council of national defense, that standard dimensions for motor truck engines and transmission machinery under army requirements have been agreed upon. Weekly meetings of truck manufacturers and engineers will be held in Washington and Detroit to perfect the standardization code. A conference in Washington to consider standardizing axles, radiators and frames has been called for June 15 by officials of the society.

Expect New Coal and Coke Rates to Prevail

Washington, June 12.—Tin plate manufacturers of West Virginia and the Seaboard By-products Co. were the only protestant to appear before the suspension board of the interstate commerce commission June 8 in connection with the proposed freight rate increase of 15c a ton on coal and coke. It is believed that the advance will be allowed to go into effect. Large consumers of coal and coke apparently are of the opinion that, with the return of normal conditions, the railroads will make volutary reductions in the coal and coke rates.

Compensation Laws

Are Analyzed and Criticized by National Conference Board

Endorsement of the underlying principles of workmens' compensation laws, and constructive criticism of their practical application are the chief features of a report on "Workmens' Compensation Acts in the United States — The Legal Phase", issued June 2 by the National Industrial Conference Board. The following suggestions were submitted.

First: That the various states, in order to reduce existing conflict and uncertainty, immediately undertake to establish a permanent, scientific, and uniform system of compiling accident statistics.

Second: Clear distinction in statutes between the terms "occupational disease," "accident" and "injury."

Third: Direct settlement of claims between employer and employe, the interests of the employe to be properly safeguarded.

Fourth: An exclusive system of compensation.

This report on the legal phase of workmen's compensation acts is to be followed by other reports on the medical, economic and administrative phases.

Industrial Wage Disputes Are Settled Quickly

Recent labor troubles include: Molders at the Walter Scott & Co. foundry, Plainfield, N. J., on strike; employes of Taunton-New Bedford Copper Co., New Bedford, Mass., return to work with 10 per cent increase; plant of Richardson & Boynton Co., Dover, N. J., idle because of shop grievances; boilermakers in plant of Drake-Williams-Mount Co., Omaha, Neb., on strike demand 62½ cents an hour; strike at Mathis Shipbuilding Co., Camden, N. J., settled by federal mediation; strike of molders at the H. B. Smith Co., Westfield, Mass., called off, and 200 molders out at Malleable Iron Co., Branford, Conn., because of monthly instead of weekly payment of a 20 per cent bonus.

Wage Increases

Among the bonus plans and wage increases recently announced are the following: An increase of 10 per cent to employes of the Smith-Winchester Mfg. Co., South Windham, Conn.; a bonus of 20 cents daily to workmen in the Florence Iron Works, Florence, N. J., for sobriety; a 10 per cent advance to 25,000 employes of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; a voluntary increase to employes of the Hazard Wire Rope Works, Wilkes-Barre, Pa.; a 10 to 20 per cent advance to mechanics in the Hyde Mfg. Co., Southbridge, Mass.; all puddlers of the Reading Iron Co., Reading, Pa., were increased to $9.75 a ton; molders and coremakers of Nashua, N. H., iron foundries have received a 10 per cent increase; an advance of 10 per cent to employes of the Gilbert & Barker Mfg. Co., Springfield, Mass.; a 10 per cent increase to employes of the Fore River Shipbuilding Corp., Quincy, Mass.; Lowell, Mass., iron foundries have granted molders 50 cents a day additional; an increase of from 5 to 12 per cent in wages, besides a bonus to workmen in the Carpenter Steel Works, Riverside, Pa., and a bonus of from 4 to 10 per cent on wages for the first half of the year to employes of the Union Twist Drill Co., Athol, Mass.

Much Toluol

Will be Needed by Government—Inquiry for 200,000 Gallons

New York, June 9.—Considerable contract buying of benzol for export has characterized the coal tar products market during the week. A huge amount of additional foreign business is pending and would be placed were it not for the fact that the government's machinery for buying supplies for the allies in the future has not yet been perfected. On the completion of purchasing arrangements it is expected that large quantities both of benzol and phenol will be closed for export. Pure benzol continues to be quoted at 55 to 60 cents per gallon, at producers' plant both for spot and contract. Phenol is quoted at 40 to 44 cents per pound, at producers' plant, for spot and this range also covers the contract market although it is understood some contract business has been done lower during the week.

Indications point to the likelihood that the entire unsold production of toluol over an indefinite period will be needed for the manufacture of trinitrotoluol for the government. One high explosive manufacturer now is inquiring on 200,000 gallons of toluol in connection with a government order. Additional inquiries originating in government requirements are expected to come out shortly. Toluol continues to be quoted at $1.75 to $2 per gallon, at producers' plant for spot and at $1.50 to $1.75 contract.

Demand for solvent naphtha continues to improve but this product still lacks definite strength. Solvent naphtha is quoted unchanged at 18 to 25 cents per gallon, at producers' plant, for spot and at 18 to 22 cents for contract.

Sulphate of ammonia for spot shipment has been sold at advanced prices during the week and now is quoted at $4.85 to $5 per 100 pounds, at seaboard. The contract market is unchanged to $4.40 to $4.50. Further contract commitments have been made during the week. The supply of spot is very limited.

Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.	
Pure benzol	$0.55 to .60
Toluol	1.75 to 2.00
Solvent naphtha	.18 to .25
Per Pound at Producers Plant.	
Phenol	$0.40 to .44
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$4.85 to 5.00

Contract.

Per Gallon at Producers Plant.	
Pure benzol	$0.55 to .60
Toluol	1.50 to 1.75
Solvent naphtha	.18 to .22
Per Pound at Producers Plant.	
Phenol (nominal)	$0.40 to .44
Per 100 Pounds at Seaboard.	
Sulphate of ammonia	$4.40 to 4.50

Rebuilding Stack

At Harrisburg for Ferromanganese—Other Furnaces on This Alloy

Lochiel furnace at Harrisburg, Pa., which was purchased by Edward E. Marshall, Philadelphia, May 1, from the Bethlehem Steel Co., is in process of rehabilitation and is expected to blow in the latter part of July on ferromanganese. Mr. Marshall is adding a preheater and two additional Whitwell stoves and is increasing the height of the stack by 10 feet. Lochiel's former dimensions were 65 x 13½ feet, and the stack was provided with two stoves. The two additional stoves now being installed until recently formed a portion of the abandoned Breaker Island furnace plant of the American Steel & Wire Co., at Troy, N. Y.

Newport furnace of the Juniata Furnace & Foundry Co., Newport, Pa., which is being operated under lease by Mr. Marshall recently was shifted from 60 to 80 per cent ferromanganese. The Juniata Furnace & Foundry Co. is owned jointly by Alfred Marshall and Edward E. Marshall. Frank F. Amsden is manager of the Lochiel furnace and Alfred Marshall of Newport.

Sheridan furnace of E. J. Lavino & Co., at Lebanon, Pa., has been blown in on ferromanganese after relining. One of the Donaghmore furnace of the Bethlehem Steel Co., at Lebanon, Pa., which now is making ferromanganese, is expected to go in on foundry iron early in July.

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

War Fears Eliminated From Business

SUFFICIENT time has elapsed since the United States entered the war to bring assurance in business circles that a period of continued and probably increased trade activity lies ahead. Doubts as to the influence upon the credit situation and the money market of the enormous war financing now being undertaken have vanished.

The stock market, which marked time for weeks following our declaration of a state of war, pending definite indication of the future trend of affairs, has returned to a state of activity with rising prices. It clearly bases its present attitude upon the belief that trade activity is not to be disturbed for some time to come. Supporting this judgment of the stock market are the showings recorded by all the well-known trade barometers, chief among which are the monthly records of pig iron production and of bank clearings. Pig iron production in May, as shown by THE IRON TRADE REVIEW amounted to 3,414,898 tons, the largest monthly total on record, excepting only October, 1916. Clearing house exchanges of bank checks, as recorded by the *Financial Chronicle*, were the largest for any corresponding month on record, showing an increase of 27 per cent over 1916. Commercial failures were relatively moderate, indicating little business disturbance as a result of our new international relations. In May, according to *Dun's Review*, they numbered 1296, with liabilities of $11,771,891, as compared with 1482 for liabilities of $19,466,436 a year ago. Gross earnings of railroads reporting in May showed an increase of 31½ per cent over a year ago, to a new high monthly record. The unfilled tonnage statement of the Steel Corporation, in normal times a trade barometer, at present conveys little significance in its month to month variations. The decline of 296,492 tons last month was due probably to the policy of reserving capacity for the government's requirements.

Industrially the country is oversold, a condition which is accentuated by the government's war preparations. Production is limited, not by the theoretical capacity of mines, mills, looms, furnaces, ovens, etc., but by the supply of labor and by transportation facilities. The urgent call for some of the basic materials by the government is causing producers in some cases to withdraw entirely from the market. For instance, it is estimated the needs of our government and the allies added to the normal domestic consumption, would amount in the course of the next year to one and one-third times the country's annual production. The leading producers have refused to sell any lead for some time and have been allotting their regular customers only a portion of their requirements. The result has been a runaway market, with prices at 12 cents and above, the highest figure since the close of the Napoleonic wars, which occurred 102 years ago.

Scarcity of Labor Causing Producers Great Anxiety

As time goes on, producers of various metals and materials show less willingness to accept far-distant contracts, owing to the inadequate freight facilities, the shortage of raw material and the scarcity of labor. The last-named factor is a source of growing anxiety in business circles, as they look forward to the withdrawal of upwards of 1,000,000 men for military service this autumn. It is feared in some quarters that unless there is some unexpected relief, this additional drain upon labor, aggravated by disappointing grain crops, will see a period of unsettlement. Wages undoubtedly will continue to rise, with further price advances following closely. Wall street, despite its present air of optimism, is keeping a weather eye on Russia. Considerable interest attended the decline in rubles last week to the lowest figure touched during the war. At 25.05 cents to the ruble, the price of Russian exchange represents a depreciation of 51 per cent as compared with normal. Italian exchange has depreciated 26.4 per cent; French, 9.8. Sterling has declined only 2 per cent.

Industries Buy Bonds for Themselves and Men

Various industrial companies continue to co-operate with the government in the purchase of war bonds, either by themselves or in behalf of their employes. In the latter event, methods of purchase by installment or otherwise have been adopted. The Brier Hill Steel Co. and the Youngstown Sheet & Tube Co. have agreed to purchase bonds for employes up to 10 per cent of the average annual earnings of each man desiring to subscribe; payment to the amount of 10 per cent of the earnings of each subscriber would be made each pay day. Cancellation of unpaid amounts in the event of death and the turning over of the bonds to the employe's estate is provided where the purchase involves not more than $100. Larger subscribers are protected in a somewhat similar manner. The United Engineering & Foundry Co. has purchased $100,000 of bonds for its own account and is expected to distribute $150,000 additional among its employes. Payment by employes is to be at the rate of either 5 per cent semi-monthly or 10 per cent monthly. Interest at the rate of 3½ per cent will be paid by the company until the bonds are free and delivered. Provision is made for cancellation of unpaid amounts against a $50 or $100 bond in event of the subscriber dying before final payment. The Trussed Concrete Steel Co. also is assisting its employes to buy bonds on a partial payment plan. The Vanadium-Alloys Steel Co., Latrobe, Pa., has purchased $100,000 of bonds and in addition will purchase all those subscribed for by employes allowing easy payments over a period of one year and requiring no interest charge pending final payment. Hyman Michaels & Co., Chicago, dealers in iron and steel scrap and relaying rails, have bought a Liberty loan bond for each employe in appreciation for

the fact that every employe has subscribed for a bond on his own part. The Graton & Knight Mfg. Co., Worcester, Mass., has subscribed $100,000 and in addition has inaugurated a partial payment plan for subscribing employes. The Wheeling Steel & Iron Co. has taken $100,000 bonds and the Bausch Machine Tool Co. $30,000. Pickands, Mather & Co., Cleveland, has subscribed $2,100,000, and it is expected this will be brought up to $3,000,000. The Columbia Steel & Shafting Co. has taken $800,000, and the Henderson Iron Works, Shreveport, La., $25,000.

Harvesters German Works Facing Confiscation

Chicago, June 12.—With manufacturing plants in Germany subject to confiscation as a war measure, the International Harvester Co. has reversed its policy against taking war orders and now stands ready to aid the government in its preparations by every means in its power.

While the United States was neutral this company refused to take war contracts for the allies, but now that the United States is in the war it will place its entire equipment on war production if necessary. Dispatches from Copenhagen have announced that a demand has been made on the government by the German association of manufacturers of agricultural machinery that action be taken against this company and the Singer Sewing Machine Co., which also has branches there. The cause of this request is the fact that the Internatonal Harvester has undertaken the manufacture of military wagons for the United States.

The German government is asked to place the plants under state supervision, deprive them of raw materials and remove exempted workmen to other factories.

George A. Ranney, secretary of the International Harvester Co., says in discussing the situation: "The Harvester company has no information from its German organization since a state of war was declared by the United States. Prior to that declaration, while the United States remained neutral, we declined to accept any and all orders for war material and supplies. Now, however, the situation is entirely changed. While it is not true we have accepted contracts for military auto trucks, it is true that we have accepted and are now filling an order from the United States government for military escort wagons. Furthermore, we stand ready to make any war supplies that the United States government may require within the ability and capacity of our plants."

Automobile Foundries in East Are Merged

The Bassick Co., Bridgeport, Conn., has been incorporated with $6,000,000 capital and has taken over the Burns & Bassick Co., Bridgeport, the M. B. Schenck Co., Meriden, Conn., and the Universal Caster & Foundry Co., Newark, N. J., which will be operated as branches. The company has organized by the election of the following officers: Edgar W. Bassick, Bridgeport, president; W. A. Schenck, Meriden, and W. R. Bassick, Bridgeport, vice presidents; W. F. Burns, Bridgeport, treasurer; C. H. Knapp, Bridgeport, assistant treasurer; F. C. Bassick, Bridgeport, secretary; A. E. Belisle, Bridgeport, assistant secretary; N. W. Cumming, Bridgeport, chief engineer; D. B. Diss, Newark, general manager, Universal works. No war material will be made. The companies acquired make automobile parts of all kinds, grease cups, casters, etc. Other companies in which President Bassick is interested are to be absorbed.

Close Central Iron and Steel Receivership

Termination of the receivership under which it has been operating is formally announced by the Central Iron & Steel Co., Harrisburg. In this announcement the company says: "During this time the mills have been, to a great degree, rebuilt and brought up to date, about 40 per cent new open-hearth capacity has been added and our blast furnace made over practically new, so that today we justly feel proud of our plant and of the ability of our organization. This business was established in 1853 and the product in the early days consisted of charcoal iron plates with an annual output of only 1000 tons. Within a few years the product was increased to 2500 tons per year and the number of employes was 50, while today our capacity is 150,000 tons of plates per year and our employes number almost 1500."

Driggs-Seabury Changes Corporate Title

All the property and assets of the Savage Arms Co. of Utica, N. Y., has been acquired by the Driggs-Seabury Ordnance Co., Sharon, Pa., and the latter has changed its name to the Savage Arms Corporation. It is not the intention of the former Driggs-Seabury Co. to discontinue the furnishing of drop forgings, frames, axles, transmissions and other parts which it has been supplying especially to the automobile trade. Plans are being formulated for large plant extensions which will enable the company to take care of increased business.

American Locomotive Buys Seaboard Castings

The American Locomotive Co. has bought the Seaboard Steel Castings Co., Chester, Pa., from the Penn-Seaboard Steel Corp. The Seaboard plant manufactures heavy castings which formerly went chiefly into marine engines but now will be diverted into locomotives. The Seaboard plant has a capacity of 18,000 tons a year.

Financial Crop Ends

The plant of the Camden Iron Works, Camden, N. J., again was offered at a receivers' sale June 6 for the second time within the past few weeks. No offers to purchase the property were made.

* * *

At the annual meeting of the directors of the Colonial Iron Co., Riddlesburg, Pa., the following officers were re-elected: C. M. Smith, president and treasurer; John M. Reynolds, vice president; F. G. Gotch, secretary, and M. L. Washburn, assistant treasurer.

* * *

An increase in capitalization from $3,500,000 to $25,000,000 has been made by the American Metal Co., Ltd., New York City. President Berthold Hochschild has been elected chairman of the board and C. M. Loeb succeeds to the office of president.

* * *

April earnings of the McCord Mfg. Co., Detroit, maker of railway supplies, automobile accessories and power plant specialties, were $84,456, equivalent to $1,013,472 net annually. For the first four months of 1917, earnings were $319,890, or at the rate of $959,670 annually.

* * *

The Transue & Williams Steel Forging Corporation, Alliance, O., earned in May $113,176 net, or at the rate of $13.50 a share annually on the outstanding stock. Cash and quick assets on May 31 were $2,920,750, and liabilities $794,295. An extra or larger dividend is expected to be declared at the next meeting.

* * *

A merger of the Gschwind Furnace Co., Youngstown, O., and the Star Iron Works Co., Gowanda, N. Y., has been effected. The name of the new organization is the Star Iron Works Co., Inc. The main office, machine shop and foundry will be located at Gowanda, N. Y. A branch office will be maintained at 15 Wick avenue, Youngstown, O. The officers of the new company are: President and sales manager, C. E. Gschwind; vice president, W. W. Watson; secretary, treasurer and general manager, D. H. Foster.

War Plans Stimulate Tool Buying

Heavy Demand For Large Machine Tools and Conveying Equipment—Valley Firms Order Plate Mills—Dealers Anticipate Further Livening of Market as More War Orders Are Placed

INFLUENCE of the government's military and naval preparations steadily is extending itself throughout the machinery market. Many manufacturers who have received United States shell contracts now are finding it necessary to replace equipment sold since the completion of contracts for the allies or wornout tools. While few of these inquiries are considerable in themselves, the aggregate constitutes a big item in the machinery market. Demand for single-purpose lathes has improved greatly. The call for heavy lathes, milling machines and shapers is stronger than ever. Some fancy prices are being paid for second-hand equipment by manufacturers who cannot afford to wait for the extended deliveries on new equipment. For instance, a boring mill which has been in use 12 years appeared in the market and bidders quickly forced the price to a level higher than the original purchase price. Deliveries on small lathes, miller and drilling machines still are good, some sellers being in a position to ship from stock.

French Firm Inquires for Shears

E. W. Bliss & Co., Brooklyn, N. Y., have bought about 10 drilling machines and are considering buying other equipment in connection with new shell contracts. The Valley Iron Works, Williamsport, Pa., is inquiring for several 72 to 84-inch lathes. The Bartlett-Hayward Co., Baltimore, also is negotiating for shell machinery. The Canadian Bridge Co. recently offered a large quantity of shell machinery in the American market. The Compagnie de Fives-Lille, Paris, France, is inquiring for about $200,000 worth of punches and shears. The Baltimore Dry Dock & Shipbuilding Co. has issued an inquiry for about $500,000 worth of general ship yard equipment. The General Electric Co., Schenectady, N. Y., has placed orders for a few more tools, but has not yet acted on the big list it issued a few weeks ago.

Ship Cranes in Demand

Inquiry for conveying equipment, especially shipbuilding cranes, continues active. Owing to the deferred deliveries on new cranes, prospective buyers are scouring the second-hand market. The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., has closed for eight 15-ton and one 75-ton electric traveling cranes with Heyl & Patterson, Pittsburgh, at an approximate cost of $200,000, not including electrical equipment which was placed directly with the General Electric Co. The Baltimore Dry Dock & Shipbuilding Co.'s inquiry for about 20 various types of cranes continues as the largest individual business now before crane builders. This company recently closed for one or two locomotive cranes. The Estonaga Coal & Coke Co., Philadelphia, has closed for two electric traveling cranes. A number of single orders for cranes also have been placed of late. One of the biggest new shipbuilding projects to attract attention in the trade is the Eastern Shipbuilding Co., which was incorporated at Dover, Del., last week, with authorized capital stock of $30,000,000.

Valley Mills Place Orders for Rolling Equipment

MANUFACTURERS of finished steel products in the Pittsburgh district are closing for additional rolling mill equipment, in an effort to meet tremendous demands of consumers. The Youngstown Sheet & Tube Co., Youngstown, O., has placed contracts for one 84-inch and one 96-inch, 3-high, electrically-driven plate mills, including tables and drives, with the Mesta Machine Co., Pittsburgh. The Brier Hill Steel Co., Youngstown, O., has ordered a 110-inch plate mill and auxiliary equipment from the United Engineering & Foundry Co., Pittsburgh. The latter concern has awarded contracts for 10 electric traveling cranes, including one 25-ton, one 50-ton and eight 15-ton cranes to the Morgan Engineering Co., Alliance, O. The Mesta Machine Co. has bought two 50-ton cranes from the Pawling & Harnischfeger Co., Milwaukee. The Carnegie Steel Co. is closing on a 50-ton crane for its works at Duquesne, Pa. Many prospective crane buyers are scouring the market for second-hand equipment.

Heavy Machines Lead in Western District

CHICAGO dealers in machinery find the trend toward heavier types of tools becoming intensified, indicating the development of gun work and other demands of the government for bigger pieces than have been produced by most shops in the past. Recent sales include 6-foot radial drills, of which five were sold to one concern, 60-inch planers, 5-foot boring mills and 36 to 48-inch lathes. With fewer orders than usual the money represented in current sales is larger than usual. On the heavy types, six to eight months delivery is the best that can be done. Second hand machinery is quiet except in cases of large tools in excellent condition which are taken quickly in view of long delay on new machines. Lists of tools for the Illinois Central and Santa Fe railroads are still pending but orders are expected to be placed shortly. The Falls Machine Co., Sheboygan, Wis., is completing an order of motors for the government and has laid off some men. The Oliver Typewriter Co., Chicago, is finishing a contract for screw machine parts for shell timers and is also reducing operation.

Industrial expansion continues and new plants and additions are announced all over the west. The Metal Block & Ingot Co., Chicago, is building a plant; the Economy Boiler Co., Ann Arbor, Mich., is building a machine shop and boiler plant; the Chelsea Steel Ball Co., Chelsea, Mich., is building a factory. The Citizens Gas Co., Indianapolis, is preparing to add a machine shop. The Belden Mfg. Co. and the Chicago Fuse Mfg. Co., both of Chicago, have bought sites and will build new plants. A. Guthrie & Co., St. Paul, will build a plant at Midway. The Winther Motor Truck Co., Kenosha, Wis., has decided to build its plant at

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"AGATHON" Nickel Steels
"AGATHON" Vanadium
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Philadelphia Office: 902 Widener Bldg., Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents

Winthrop Harbor, Ill., a suburb of Kenosha. Pawling & Harnischfeger, Milwaukee, crane manufacturers, are adding to their power plant and equipment to care for additional business. The Great Falls Iron Works, Great Falls, Mont., will add a structural shop and foundry. The Dixie Engineering Co., Enid, Okla., is adding equipment. Waterworks and electric light extensions are being undertaken by Hays, Kans.; a waterworks system and power plant are to be built at Livingston, Mont. Reno, Nev., is planning waterworks improvements to cost $550,000.

Cleveland Dealers Expect Increased Activity

INCREASED activity in the machine tool market within the next 60 or 90 days is predicted by dealers in Cleveland. It is expected that government demands for army and navy equipment which must be filled in the near future will be responsible for a greatly stimulated industrial expansion. Shortage of labor is another factor which will tend to excite the market for labor-saving tools such as cranes and material handling devices. Manufacturers in general are, at the present time, replacing workmen with machines wherever it is possible and are enlarging their facilities. The volume of business is made up of a large quantity of small orders for general shop equipment sufficient to make the total very satisfactory. Government orders for shells of large caliber have served to create a keen demand for heavy boring mills, planers and similar tools. Dealers here are unable to cope with the demand for machines of this character. Second hand tools have been almost entirely removed from the market. Miscellaneous sales of railroad and traveling cranes have been made; inquiries are current for others.

New Construction and Equipment

Concise and Timely Business Building Opportunities from the Field of Industry

Among New England Factories

BOSTON.—The government will build a $4,000,000 drydock on South Boston flats. Rock excavation has started and plans are being drawn for pumping plant and caisson work.

BOSTON.—The Dana S. Courtney Co. has been incorporated with $500,000 capital by J. Sidney Stone, Alexander G. Grant and Herbert P. Mason, Saugus, Mass.

LEXINGTON, MASS. — Plans are being drawn for a brick, 2-story, 80 x 200-foot high school building to cost $175,000.

LOWELL, MASS.—The Tremont & Suffolk Mills has let the contract for a 1-story, 182 x 337-foot weave shed to cost $100,000.

MALDEN, MASS.—Fitz, Dana & Co., Boston, steel and metal dealers, will build a $100,000 warehouse at Commercial and Medford streets.

MALDEN, MASS. — The Boston Rubber Shoe Co., Boston, has let the contract for a 4-story, 102 x 138-foot factory to cost $100,000.

NATICK, MASS.—The Palmer Mining Co. has been incorporated to operate a mine in Lake county, Colo., with $50,000 capital, by Arthur E. Felch, Albert J. Wright and Herbert A. Horgan, Revere, Mass.

NEW BEDFORD, MASS. — The Belleville Warehouse Co. will build a reinforced concrete, 500-foot extension to its warehouse on Nash road.

SOUTH BOSTON, MASS. — Fire recently damaged the chemical plant of T. C. Ashley & Co. and the warehouse and work rooms of the International Waste Co., causing $100,000 loss.

SOUTHBRIDGE, MASS.—The Hyde Mfg. Co., maker of cutlery, etc., has let the contract for a 1-story, 30 x 250-foot, and a 70 x 90-foot mill. A contract for a boiler house, 15 x 32 feet, has also been let.

TAUNTON, MASS. — The plant of the Miehle Printing Press & Mfg. Co. has been sold to Arthur H. Weed, of Boston. The property will be used for manufacturing purposes.

WORCESTER, MASS. — The Arcade Malleable Iron Co. has let the contract for a brick, 1-story, 75 x 150-foot foundry building to cost $12,000.

WORCESTER, MASS. — The Parker & Harper Mfg. Co. has been incorporated to make machinery, tools, etc., with $25,000 capital, by Waldo D. Parker, Joseph Parker and Earl T. Harper.

WORCESTER, MASS.—Hollander & Johnson, Inc., has been incorporated to make drop forgings, dies, tools, etc., with $20,000 capital, by Sven G. Hollander, Claus O. Johnson and J. Otis Sibley.

NORTH DIGHTON, R. I.—The Mt. Hope Finishing Co. has let the contract for a reinforced concrete, 1-story, 175 x 380-foot manufacturing building.

PAWTUCKET, R. I.—The Potter & Johnston Machine Co., 1027 Newport avenue, will build a machine shop addition to cost $50,000.

PROVIDENCE, R. I.—The Apco Mfg. Co. has been incorporated to make automobiles and accessories, with $200,000 capital, by Thomas F. Wilson, Daniel J. Healey and James E. Brothers, Providence, R. I.

PROVIDENCE, R. I.—The Fields Point Mfg. Co. has let the contract for a 1-story, 52 x 152-foot manufacturing building at Fields Point.

PROVIDENCE, R. I.—The Graham Mfg. Co. has been incorporated to deal in machinery, tools, etc., with $30,000 capital by Arthur W. Graham, Alfred G. Chaffee and Andrew E. Johnson, Pawtucket, R. I.

BRIDGEPORT, CONN.—The Voltox Co. will build a brick, 2-story, 32 x 80-foot addition to its factory.

HARTFORD, CONN. — The New Hotel, Inc., has been incorporated to build a hotel with $800,000 capital by Clarence E. Whitney, L. P. Waldo Martin and Ralph O. Wells.

HARTFORD, CONN.—The Morrow Machine Co. will erect a 3-story plant addition, 47 x 96 feet. Ford, Beck & Sheldon, Inc., 60 Prospect street, are the engineers.

MIDDLETOWN, CONN. — The Russell Mfg. Co. has let the contract for a reinforced concrete, 48 x 114-foot mill building.

NEW HAVEN, CONN.—The Eastern Machine Screw Co. will build a plant addition, 2-story, 50 x 146 feet.

SHELTON, CONN. — Sidney Blumenthal will erect a 1-story boiler house, 50 x 81 feet. Woodell, Bulkley and Woodman, 8 West Fortieth street, New York, are the engineers.

STAMFORD, CONN.—The Stamford Electric & Mfg. Co. has been incorporated with $150,000 capital by Edward Heitman, William M. Foord and Matthew H. Kenealy.

TORRINGTON, CONN. — The Torrington Co. has been incorporated to make machinery, tools, etc., with $11,000,000 capital by Allen E. Moore and George F. Jebbett, both of New York and S. C. T. Todd, Brooklyn.

WATERBURY, CONN. — The Thompson-Starrett Co., New York, has been awarded the contract for a 4-story, 50 x 260-foot office building for the Chase Rolling Mill Co., and the Chase Metal Works.

WOODBURY, CONN.—The Phelps & Farr Mfg. Co. has been incorporated with $50,000 capital by J. W. Phelps, Francis T. Reeves and Leon G. Farr.

The First Specialists in Export Trade

Britain's awakening to a world beyond its shores came with the Phoenecians who bartered their wares for the tins of Cornwall. These Phoenecians were the first international traders. They shipped and sold the goods made by their neighboring tribes and took in exchange the raw products of the lands overseas.

International trade follows the same lines today. Manufacturers must specialize in making the goods while merchants, trained in the intricacies of the export business, must ship, finance and sell these products in the foreign markets.

American business efficiency has now been applied to this world old business by the Federal Export Corporation, a company which provides the most direct means of developing the overseas markets for American manufacturers. In this one organization have been combined every branch of the export trade. We buy, insure, ship and finance each order we obtain through foreign sales staff. Every man in our organization is a specialist in some form of foreign commerce. Our sales propaganda covers every open market abroad. And our own ships provide the means of quick distribution for our American clients and our foreign customers.

We will be glad to explain how our services can be applied to securing a growing export business for your products. The earlier you take advantage of the present commercial situation the more permanent will be your results.

We will gladly explain our methods to you if you will write us for particulars.

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SHIPPING DIVISION
Cosmopolitan Shipping Co. Inc.

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Along the Middle Atlantic Seaboard

BROOKLYN, N. Y.—Joseph M. Huber, 65 West Houston street, will build a 1-story boiler house extension.

HAMMONDSPORT, N. Y. — The Curtis Aeroplane Co. will build a machine shop addition, 2-story, 41 x 63 feet.

JAMESTOWN, N. Y. — The Cleveland Worsted Mill Co. has preliminary plans for a $500,000 factory and dye house.

NEW YORK.—The Saxton Auto Accessories Co., capital $100,000, will manufacture accessories and supplies. L. D. Saxton, P. F. Hayes and J. J. Fennell, 150 West 103rd street are the incorporators.

NEW YORK.—The city of New York will build a power house, laundry and storage building, to cost $200,000. Burdett G. Lewis, commissioner of the department of corrections, municipal building, has charge.

NEW YORK.—The James Wood Carving Corporation has been chartered with $125,000 capital. Wood carving machines are to be manufactured. The incorporators are: C. R. Irving, J. James and C. P. Carson, 601 Fifth avenue.

NEW YORK. — The Northern Graphite Corp., recently incorporated with $250,000, will mine, mill and concentrate ores. The incorporators are: G. A. Alonzo, S. Banome and R. Loudon, 2 Rector street.

NEW YORK.—Stephen Ranson, Inc., has been chartered with $50,000 capital to do marine plumbing and steamfitting, by F. R. Serles, H. G. Wensol and S. Ranson, 419 West 141st street.

NEW YORK.—The Gibralter Jack Co. has been chartered with $100,000 capital to manufacture auto accessories, by M. Morris, W. Schaumberg and A. F. Wagner, 150 Nassau street.

NEW YORK.—The Nassau Smelting & Refining Works, incorporated with $1,000,000 capital, will make foundry and factory supplies. B. and L. Lowenstein and I. H. Livingston, 603 West Twenty-ninth street, are the organizers.

NEW YORK.—The Tottenville Copper Co., chartered with $1,000,000 capital, will smelt and refine metals. The incorporators are: B. and L. Lowenstein and I. H. Livingston, 603 West Twenty-ninth street.

NEW YORK.—The General Avion Co., capitalized at $400,000 will make mechanical contrivances for aerial navigation. D. S. Adams, H. F. Cuntz and W. M. Oler Jr., 1480 Broadway, are the incorporators.

NEW YORK.—The Eagle Wrought Iron Works, 580 Jackson avenue, will improve its plant at a cost of $10,000.

PEEKSKILL, N. Y.—Southard, Robertson & Co. have let the general contract for a 2-story stove plant, to cost $35,000, to the Embury & Morris Construction Co., 51 East Forty-second street, New York City.

SYRACUSE.—New York State Railways has had plans drawn for shop, car barn and employes building, 1-story, 75 x 150 feet. B. Tilton, Gridley building, is in charge.

ALLENTOWN, PA. — The Lehigh Valley Power Co. will build a boiler house addition. Ford, Bacon and Davis, 115 Broadway, New York City, are the engineers.

ALTOONA, PA.—The Pennsylvania railroad will build 1-story tank shop, 90 x 300 feet, to cost $350,000. Division Engineer C. D. Brinser, Altoona, will take bids soon.

BRADFORD, PA.—The Penn Brick Co. has been incorporated with $100,000 capital by E. E. Lindemuth, Lewis Emery, A. R. Johnson and J. E. Cochran.

ERIE.—The Anchor Line, Holland street, has awarded H. L. Stevens & Co., 910 South Michigan avenue, Chicago, a contract to erect an unloading tower, to cost $100,000.

MARIETTA, PA. — The National Casting Co. has purchased a manufacturing building. Improvements are contemplated.

Government Inquiries

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., is in the market for the following machine tools:

Two portable electrically-driven drills, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two motor-driven, 30-inch radial drills, 1221, no date, Brooklyn, N. Y. and Mare Island, Cal.

Two motor-driven, 16-inch sensitive drills, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two 2-wheel, motor-driven column-type emery grinders, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two motor-driven surface grinders, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two motor-driven, 4-inch hack saws, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two motor-driven, back-geared extension-gap screw-cutting lathes, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Four motor-driven all-geared head, tool room, screw-cutting lathes, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Four 16-inch heavy-duty, quick-change gear, screw-cutting engine lathe, 1203, Norfolk, Va.

Two motor-driven constant-speed universal milling machines, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Two 500-ton hydraulic piercing presses, 1218, no date, Charleston, W. Va.

One 3000-ton hydraulic piercing press, complete with intensifier, 1218, no date, Charleston, W. Va.

One motor-driven double-angle shear, 1204, no date, Charleston, S. C.

Two motor-driven, tool room, column-type shapers, 1221, no date, Brooklyn, N. Y., and Mare Island, Cal.

Schedule numbers and place of delivery follow the specifications of the tools. Further information may be had on application from the Navy Department, Bureau of Supplies and Accounts.

MARIETTA, PA.—The Marietta Agricultural Works, idle a number of years, has been sold to the Pittsburgh Brass & Iron Foundry which will remodel the plant and place it in operation.

MANHEIM, PA.—The Hershey Foundry & Machine Co. is erecting a 50 x 300-foot pattern storage and a 40 x 90-foot cleaning room.

McKEES ROCKS, PA.—The county commissioners are preparing plans for a bridge over the Ohio river, to cost about $750,000.

MILTON, PA. — The American Car & Foundry Co. will build an addition to its pressed steel department. The building will be 20 x 40 feet and cost $3,500.

PALO ALTO, PA.—The Eastern Pennsylvania railroad will build a power house, car barn and machine shop. J. G. White Engineering Corporation, 43 Exchange place, New York City, is in charge of the construction work.

PHILADELPHIA.—Indiana Refining Co. is improving its 2-story plant at an expenditure of $100,000.

PHILADELPHIA.—The H. G. Gray Co., 1400 Mt. Vernon street, will build a 1-story machine shop, 50 x 100 feet.

PHILADELPHIA. — The department of public health and charities, 317 city hall, will take bids about June 15 on a 1-story power house.

PHILADELPHIA.—Warren Briscoe, 3954 Ludlow street, has been granted a permit to erect a plant addition for Wm. Birmingham at 4058 Haverford avenue.

PHILADELPHIA. — Bids are being taken for the construction of a manufacturing building at Fourth and Arch streets for J. R. Ketterlinus.

PHILADELPHIA.—The Abrasive Co. has been granted a permit to erect a manufacturing addition to its plant at James and Fraley streets.

PHILADELPHIA.—Furness, Evans & Co., Franklin Bank building, have been awarded a contract to erect a 6-story, 60 x 92-foot brick manufacturing building for the Stead & Miller Co., cost $100,000.

PHILADELPHIA.—The Hulton Printing, Processing & Dyeing Co. will build a power house, 33 x 118 feet, to cost $8,000.

PITTSBURGH. — The Trantner Mfg. Co. has purchased a site on Water street and will erect a modern factory building.

PITTSBURGH.—K. K. Leitch, 3601 Terrace street, plans to build a 4-story reinforced concrete warehouse and sales building to cost about $64,000.

READING, PA.—The Pyro Ignition Co. of New York has leased a 3-story plant and will use it for the manufacture of spark plugs.

READING, PA.—The Reading Transit & Light Co. will construct a galvanizing shop, to cost $3,500.

SCRANTON, PA.—The Maccar Truck Co. will build a 1-story power house. P. Z. Sylvester is president.

UNIONTOWN, PA. — The county has awarded the Farris Engineering Co., Empire building, Pittsburgh, a contract for superstructures and floors of bridges over Dunlap Creek and Middle Run.

ATLANTIC CITY, N. J.—The Bowman-Herr-Morgan Hotel Corp. has been incorporated to purchase lands and erect hotels, apartments, houses, etc., with a capital of $5,000,000, by Von Herr, Henry W. Morgan and H. Trilling, Atlantic City.

CAPE MAY, N. J.—The United States government contemplates expending $175,000 for a new coast air patrol station.

DOVER, N. J.—The McKiernan-Terry Drill Co has begun work on a 80 x 150-foot addition to its mining machinery plant.

HOBOKEN, N. J.—The Hibbe Chemical Works was damaged by fire recently causing a loss of $10,000.

JERSEY CITY, N. J.—The Midland Motor Co. has been incorporated with $1,000,000 capital to manufacture aeroplanes, automobiles and motors by Arthur W. Britton, Louis H.

Gunther and Harry B. Davis, 28 Nassau street, New York City.

JERSEY CITY, N. J.—The Commercial Charcoal Co. has been chartered with $50,000 capital to make charcoal, by Benjamin J. Darling, John N. Lloyd and Benjamin Dowden.

NEWARK, N. J.—The Butterworth-Judson Corp. is to erect a nitre storage building, 44 x 107 feet, to cost about $14,000.

NEWARK, N. J.—The Hubers Machine Co. has been incorporated with $100,000 capital by Herman W. Hubers, Milton Bierman and Joseph Korn, East Orange.

NEWARK, N. J.—The Utility By-Products Chemical Co. has been chartered by I. S. Froelich, William N. Kuhline and G. A. Savage. This company, capitalized at $50,000, will make chemicals, etc.

NEW BRUNSWICK, N. J.—The Manufacturers Iron & Steel Co., chartered with $8,000,000 capital, will manufacture and deal in steel, coke, etc. The incorporators are: James W. Johnson, William J. McCurdy and Robert C. Nicholas.

NORTH PATTERSON, N. J.—H. Grebenzik & Son, brass and sheet iron workers, are having plans drawn for a plant and other buildings to cost $50,000.

POINT-NO-POINT, N. J. — The Public Service Electric Co. has taken out a permit for a power plant addition to cost $365,000. This will include a 3-story addition to the power house and a 6-story addition to the switch house. A new 35,000-kilowatt generator will be installed.

TRENTON, N. J.—The Dural Rubber Co. has been incorporated with $200,000 capital by Newton A. K. Bugbee, Frederick F. Katzenbach, Edgar H. Wilson, G. F. Ginglen, James C. Tattersall, et al.

TRENTON, N. J.—Klemann & Fowler, First National Bank building, are preparing plans for the Mercer Trust Co. for buildings to cost $100,000. William G. Howell is president of bank.

TRENTON, N. J.—The Crane Co. will build a 2-story plant addition, 42 x 58 feet. F. W. McIntyre, 46 Escher street, is taking bids.

TRENTON, N. J. — The Empire Tire & Rubber Co. will build a 1-story boiler house addition to cost $10,500.

WILMINGTON, DEL.—The United States Arms & Ordnance Co., capital $10,000,000, will make ordnance, munitions, etc. M. L. Rogers, L. A. Irwin and H. W. Davis are the organizers.

WILMINGTON, DEL.—The Superior Iron & Steel Corp., capital $3,000,000, has been organized to do a general iron foundry and metal works business. The incorporators are: H. G. Eastburn, Artemus Smith and M. R. Doto.

WILMINGTON, DEL.—The Michigan Drop Forge Co. of Delaware, capitalized at $1,800,000, will manufacture drop forgings. H. E. Latter, H. M. Robinson and C. M. Egner are the incorporators.

BALTIMORE.—The Penn-Mary Steel Co. has plans for a 61 x 161-foot copper shop, to be erected in connection with the marine department of the same company.

WASHINGTON.—The Washington Steel & Ordnance Co. will build a 2-story boiler house at Geisboro Point, to be 53 x 187 feet and cost $50,000. H. F. Clark, 1812 Washington street, has charge.

Activities in the Central States

ALGOMA, WIS.—A new steam power plant will be erected by the Albrecht Mfg. Co. The equipment will include an 80 horsepower boiler. John Albrecht is president.

ETTRICK, WIS.—The stockholders of the Ettrick & Northern railroad have voted to issue $50,000 in bonds to provide funds for the completion of the first unit of the steam railway between Blair and Ettrick, upon which $40,000 already has been expended. Rails and other equipment will be purchased as soon as the bond issue is disposed of.

LA CROSSE, WIS.—The LaCrosse Tractor Co., manufacturer of gas and oil tractors, has purchased additional land opposite its works, to provide for future extensions.

MILWAUKEE.—The Le Roi Co., manufacturer of gasoline and automobile engines, is building a machine shop addition 80 x 170 feet of brick and steel, with saw-tooth roof. Charles W. Pencock is general manager.

TWO RIVERS, WIS.—C. Siberhorn will build a plant to manufacture electric heating devices.

WATERTOWN, WIS. — Otto Biefeld & Co. have bought a site 100 x 300 feet, adjoining their boiler and machine shops and will build a foundry and shop to cost $30,000.

ANN ARBOR, MICH. — The Economy Boiler Co., George Langford, president, will build a machine shop and boiler plant, 80 x 140 feet

ANN ARBOR, MICH. — The Ann Arbor Machine Co., T. S. Langford, president, will build a foundry, 80 x 200 feet.

DETROIT.—The Briggs Mfg. Co., Leuschner avenue, has increased its capital from $50,000 to $750,000 and will build an addition.

DETROIT.—The National Twist Drill Co. will build a 4-story reinforced concrete plant costing $12,000. R. H. Marr, Kresge building, is architect.

DETROIT.—The Detroit Pulley Co. has been incorporated with $12,000 capital by A. L. Avey, F. Forney, and C. W. Edgarton.

DETROIT. — The American Motor Truck Co. will equip a plant to manufacture trucks of 2 to 5 ton capacity.

DETROIT.—The Desmond Pneumatic Starter Co. has been incorporated with $50,000 capital by John E. Desmond and Nathaniel Victor.

LANSING, MICH.—The Duplex Truck Co. will build a 2-story factory, 75 x 600 feet.

LOWELL, MICH.—The city of Lowell is building a hydraulic power plant, 42 x 50 feet. H. L. Shutter is city clerk.

PONTIAC, MICH.—The Olympian Motors Co. will build a 1-story plant 200 x 300 feet.

AURORA, ILL.—The Allsteel Equipment Co. will build a 2-story plant, 80 x 300 feet, to cost $50,000.

CHICAGO.—The Bunting Boiler Co. has been incorporated in Delaware with $300,000 capital by J. T. Bunting, J. G. Burns, and C. W. Shaeffer, to manufacture boilers and steam fittings and will establish a plant in Chicago.

CHICAGO.—The Marine Safety Appliance Corp. of Chicago, has been incorporated in Delaware with $1,000,000 capital by Charles Wilde and Frank A. Hilfinger, to manufacture shipfloating devices.

CHICAGO.—The F. H. Holton Co. will build a 2-story plant 65 x 250 feet, to cost $40,000.

CHICAGO.—The Politowski Magnetic Engine Co. has been incorporated in Delaware with $1,000,000 capital to manufacture electric machinery, by A. N. Jarvis and S. M. Dane, of Chicago.

EAST ST. LOUIS, ILL.—The Railway Tie Corp. is building additions and will equip them to manufacture railway joints, tie plates, and other devices. C. A. Pearson is secretary.

GRAFTON, ILL.—The Rippley Boat Co. has bought a site at Grafton and will build a plant for the manufacture of steel boats.

MOLINE, ILL.—The Root & Vanderoot Co. will erect a 2-story, 135 x 700-foot manufacturing building, to cost about $250,000.

MURPHYSBORO, ILL.—The Southern Illinois Machine & Foundry Co., H. A. Bastien, secretary, will build a foundry, forge, and car shop 60 x 120 feet.

ROCK ISLAND, ILL. — The Bear Mfg. Co., manufacturer of automobile starters, has taken over the plant of the Sandbo Starter Co. in Rock Island. The company has been incorporated in Delaware with $200,000 capital.

SHELBYVILLE, ILL. — The Queen City Gas Co. has been chartered with $20,000 capital by M. S. Middlesworth, W. J. Eddy, George D. Chaffee, B. P. Dearing and J. L. Hoover.

ELKHART, IND.—The Crow-Elkhart Motor Co. has bought a 26-acre site adjoining its plant and will build an addition.

HAMMOND, IND. — The Railway Motor Car Co. will build an addition to its machine and foundry building to cost $50,000.

INDIANAPOLIS.—The Citizens' Gas Co. will build a machine shop to cost $25,000. J. D. Forest is manager.

AKRON, O.—The Akron-Goshen Coal Co. has been chartered with $300,000 capital by James P. Loomis, H. E. Thomas, A. H. Cummins, J. M. Rowley and J. H. Miles.

CINCINNATI.—The Trimmer-Haynes Mfg. Co. has been capitalized at $30,000. The incorporators are: J. H. Trimmer, G. D. Haynes, Allien Weber, William J. Ricker and G. J. Frederiks.

CINCINNATI.—The Willard Machine Tool Co. has been incorporated with $100,000 capital by George A. Willard, Jackson W. Sparrow, Walter A. Todd, Gustave F. Mattman and Lem S. Miller.

CINCINNATI.—The Liebel-Florsheim Co., recently incorporated with $30,000 capital, will manufacture electrical appliances. John G. H. Liebel, Edwin S. Florsheim and George Stugard are the incorporators.

CLEVELAND.—W. S. Ferguson & Co. soon will receive bids on a pattern shop for the Kilby Mfg. Co. A 40,000-gallon tank and sprinkler system are included in the plans.

CLEVELAND.—Preliminary plans for a factory for the Ideal Tire & Rubber Co., to cost about $150,000, have been drawn by W. C. Owen & Co., architects.

HAMILTON, O.—The Ohio Gas & Electric Co. has purchased a site and plans to erect a large substation.

LAKEWOOD, O. — The Lynndale-Jellico Coal Co. has been organized with $100,000 capital by W. H. Corts, Charles A. Sandals, G. A. Corta, W. S. Kohn and J. M. Sandals.

SIDNEY, O.—The Sidney Electric Co. has made application for permission to issue bonds amounting to $100,000 for improvements to its plant.

Western and Intermountain Territory

DULUTH.—Plans are being prepared by the Duluth Engineering Co. for the Fond du Lac bridge over St. Louis river. The bridge is to be of steel and concrete and will cost $50,000.

ST. PAUL.—The St. Paul Foundry Co. has bought a site on Dale street and will build a 1-story plant costing $40,000.

WARREN, MINN.—Bids will be received in June on steel and concrete bridges for Marshall county by Oswald Lind, superintendent of highways. An expenditure of $70,000 is involved.

DES MOINES, IOWA.—Contracts will be let soon for the University avenue bridge, to cost $500,000. C. Kastberg is city engineer.

DES MOINES, IA. — The Creston Auto Co. has been chartered with $50,000 capital, by James Brown, E. C. Dawson and C. A. Nord.

SIOUX CITY, IA.—The Sioux City Service Co. will build a power plant and substation costing $750,000. E. L. Kirk is general manager.

SIOUX CITY, IOWA.—The city will spend $50,000 to increase the capacity of the Main street pumping station. J. M. Lewis is superintendent.

JOPLIN, MO.—The Iron Mountain Mining & Smelting Co., Franklin M. Smith, president, is preparing to build smelters, one of which probably will be at St. Louis.

KANSAS CITY.—The Trusswall Mfg. Co., 203 New England building, will build a plant to manufacture railings.

SPRINGFIELD, MO.—A special election will be held June 16 on issuing $500,000 in bonds for an electric light plant.

ST. LOUIS.—The Dorris Motor Car Co. has been reorganized and its capital increased from $300,000 to $1,000,000. Several additions will be built. A. C. Schmidt is secretary.

ST. LOUIS.—The Inland Machine Works, John Flammang, president, has purchased a five-acre site. A 2-story plant will be erected soon.

ST. LOUIS. — The Standard Mechanical Mfg. Co. has been incorporated with $12,000 capital by Harry G. and Charles W. Wall.

ST. LOUIS, MO. — An election will be held in June, on $165,000 in bonds for an electric light plant. Charles L. Faust is city attorney.

ST. LOUIS.—The United Mfg. Co. recently has been organized with $15,000 capital, to manufacture electrical appliances, by W. G. Byrnes, C. R. Baldwin and W. L. Cummiskey.

ST. LOUIS.—The Clenzall Machines Co. has been incorporated with $60,000 capital, to manufacture cleaning, washing and drying machines, by F. H. Ehnts, Philip B. Fouke and Albert M. Ahern.

FORT SMITH, ARK.—Plans are being prepared for a bridge over Arkansas river to cost $350,000.

ELGIN, TEX.—The Elgin Standard Brick Co. has increased its capital from $30,000 to $75,000 and will expend about $40,000 for additional machinery and equipment.

HOUSTON, TEX. — The Finucane Boiler Works, T. J. Finucane, president, will build a new plant and install some new equipment including a crane.

WEATHERFORD, TEX.—The Acme Wire Buckle Co. has been incorporated with $10,000 capital by W. C. Ragsdale, D. E. Eddleman and R. A. Eddleman.

BILLINGS, OKLA.—Bids will be received until Aug. 1 for water and electric light plants costing $50,000. L. Panton is president of the board of public works.

ENID, OKLA.—The Geronimo Motor Co. will build a factory 65 x 300 feet, with a 40 x 65-foot wing. H. R. Wilk is treasurer.

HENRYETTA, OKLA. — The Henryetta, Dewar, Kusa Traction Co. has been chartered with $350,000 capital, by J. J. Harrison, C. W. Burnett, and Barclay Morgan.

KINGSTON, OKLA.—The Kingston Ice & Light Co. has been chartered with $20,000 capital, by George F. Blethen, J. W. Wilkins and N. F. Benson.

SAPULPA, OKLA.—The Manhattan Construction Co., Muskogee, Okla., has been awarded a contract for a 5-story office building, 50 x 150 feet, to cost $110,000.

TULSA, OKLA.—The Universal Motor Co. will build a 4-story assembling plant 140 x 150 feet.

BAXTER SPRINGS, KAS.—The city of Baxter Springs plans a municipal water works system to cost $85,000.

GORDON, KANS.—The Empire Pipe Line Co. is erecting four factory buildings costing $45,000.

SALINA, KAS.—Felix Broeker is having plans drawn by Barnett, Haynes & Barnett, architects, for a 5-story office building, 100 x 120 feet, to cost about $400,000.

COOPERSTOWN, N. DAK.—The city will install a 50,000-gallon tank and a 100-foot tower.

DENVER. — The Linde Air Products Co. will build a plant costing $100,000.

LIVINGSTON, MONT.—Plans have been completed for a water works system including a power plant. Bonds for $225,000 have been voted.

GRACE, IDAHO.—An election will be held June 9 to issue $25,000 in bonds for a municipal water works system. E. Christenson is village clerk.

HAYDEN LAKE, IDAHO.—The Commonwealth Mining Co. will install a concentrator to cost $20,000. Ernest C. Wood is superintendent of the company.

KELLOGG, IDAHO.—Frederick W. Bradley, president of the Bunker Hill & Sullivan Mining Co., states that the company will build an electrolytic smelter, with a daily capacity of 30 tons of zinc ore.

SALT LAKE CITY.—The Seminole Copper Co., F. L. Wilson, Brooks Arcade, secretary, is planning to install a mill to treat tungsten ores at Gold Hill.

STAFFORD, ARIZ. — The Atlas Copper Co. is preparing to build a 300-ton concentration plant at San Juan mine.

The Pacific Coast States

PUGET SOUND, WASH.—The United States government, care of F. R. Harris, chief of the bureau of yards and docks, navy department, Washington, will ask bids soon on a navy yard to cost $570,000.

SEATTLE.—Bids will be received by the board of public works up to July 20 for the construction of a proposed addition to the hydro-electric power system. Additional construction work to be done this year includes central sub-stations, distribution stations, pipe line, an underground system, stores and shop buildings. An expenditure of $400,000 is involved.

SPOKANE.—The Spokane Corrugated Culvert & Tank Co. contemplates building a factory and office building and installing about $20,000 worth of machinery.

TACOMA, WASH. — Announcement has been made that plans will be ready soon for the proposed $300,000 depot for the Chicago, Milwaukee, & St. Paul railroad.

ASTORIA, ORE. — The port commission plans the installation of a semi-diesel power unit at a cost of $16,000.

PORTLAND, ORE.—Twohy Brothers have secured a contract for the construction of 300 freight cars for the Southern Pacific railroad.

PORTLAND, ORE. — Contracts for the construction of the first 10-mile unit of the railroad between here and Tillamook were awarded to I. J. Roster and Arthur Porter, grading the Inter-State Bridge Co., bridge work and W. D. Haley, materials.

LOS ANGELES.—The L. & B. Mfg. Co., maker of automobile parts, will build a factory. B. P. Bidelman is president.

LOS ANGELES.—The United States Spring Co., recently incorporated, will build a plant on Los Angeles street.

OAKLAND.—The Oliver Mfg. Co. will build a plant costing about $500,000 equipped with traveling cranes, lathes, and other metal working machinery. William Letts Oliver is president.

OAKLAND, CAL.—The American Iron & Brass Foundry Co. is adding to its plant. Additional equipment has been ordered.

STOCKTON, CAL.—The Monarch Foundry Co. has purchased a site and plans to erect a machine shop, 100 x 150 feet.

New Catalogs

POWER MACHINERY.—A comprehensive list of used equipment including electric, hydraulic, steam and gas actuated machines is given in a small booklet issued by Mac Govern & Co., 114 Liberty street, New York. The apparatus listed in this pamphlet includes direct and alternating-current motors, turbine units, direct-connected reciprocating units, gas and oil engines, water-tube boilers, pumps, hoisting machinery, etc.

VALVES.—The Edward Valve & Mfg. Co. is distributing a 94-page booklet devoted to valves. The valves are made from semi-steel, bronze, steel and monel metal. The steel employed is said to have an elastic limit of 37,340 pounds per square inch, and a tensile strength of 72,650 pounds per square inch. Monel metal is especially recommended for use in valve trimmings under severe conditions. This material is said to be tough and ductile, to resist corrosion, and to maintain its strength under high temperatures.

Iron and Steel Prices

IRON ORE

Superior Ores, Per Ton, Lower Lake Ports.	
Old range Bessemer, 55 iron	5.95
Mesabi Bessemer, 55 iron	5.70
Old range non-Bess., 51½ iron	5.20
Mesabi non-Bess., 51½ iron	5.05
Port Henry Ores, non-Bessemer, Per Unit,	
Delivered Eastern Pennsylvania.	
Old Bed, crude 55 iron	10.50c to 11.00c
Old Bed., concent., 65 iron	11.00c to 11.50c
Harmony, concent., 63 iron	11.50c to 11.75c
Lump (at mines)	$5.75

WAREHOUSE PRICES

Steel bars, Chicago	4.50c
Steel bars, Cleveland	5.00c
Steel bars, Detroit	4.50c
Steel bars, Philadelphia	5.00c
Steel bars, New York	5.00c
Steel bars, St. Louis	4.55c
Steel bars, Cincinnati	4.65c
Steel bars, St. Paul	4.60c
Steel bars, over 2-in., Buffalo	4.50c
Steel bars, Buffalo	4.40c
Iron bars, Chicago	4.50c
Iron bars, Cleveland	4.95c
Iron bars, Detroit	4.50c
Iron bars, St. Louis	4.45c
Iron bars, Cincinnati	4.65c
Iron bars, Philadelphia	4.75c
Iron bars, New York	4.75c
Shapes, Chicago	5.00c
Shapes, Detroit	5.00c
Shapes, St. Louis	5.05c
Shapes, St. Paul	5.10c
Shapes, New York	5.25c
Shapes, Cleveland	5.25c
Shapes, Philadelphia	4.75c to 5.00c
Shapes, Buffalo	4.60c
Shapes, Cincinnati	5.00c
Plates, Chicago	7.00c to 8.00c
Plates, Detroit	8.00c
Plates, St. Louis	7.05c
Plates, St. Paul	7.10c
Plates, New York	9.09c
Plates, Cleveland	7.50c
Plates, Philadelphia	9.50c to 10.00c
Plates, Cincinnati	7.50c
No. 10 blue anl. sheets, Chi.	8.50c
No. 10 blue anl. sheets, Cleve.	8.00c
No. 10 blue annealed, Buffalo	4.50c
No. 10 blue anl. sheets, St. L.	8.55c
No. 10 blue anl. sheets, Cincin.	8.15c
No. 10 blue anl. Sheets, St. Paul	8.60c
No. 10 blue annealed, Detroit	8.00c
No. 28 black sheets, Chicago	8.50c
No. 28 black, Cleveland	8.25c
No. 28 black sheets, Cincin.	8.15c
No. 28 black, Detroit	8.00c
No. 28 black sheets, St. L.	8.80c
No. 28 black sheets, St. Paul	8.60c
No. 28 galv. sheets, Chicago	10.00c
No. 28 galvanized, Cleveland	10.00c
No. 28 galv. sheets, Cincin.	10.15c
No. 28 galvanized, Detroit	11.00c
No. 28 galv. sheets, St. L.	10.80c to 11.20c
Hoops, Cleveland	6.00c
Hoops, Detroit	6.00c

IRON AND STEEL SCRAP

STEEL WORKS USE

(Gross Tons)

Bundled sheets, Pittsburgh	$24.50 to 25.00
Bundled sheets, Cleveland	22.00 to 24.00
Bundled sheets, Buffalo	16.50 to 17.00
City wrought, short, N. Y.	28.00
Frogs, switches, guards, St. L.	35.00 to 36.00
Heavy melting steel, Pitts.	40.00
Heavy melting steel, Buffalo	40.00 to 41.00
Heavy melting steel, Chicago	34.00 to 34.50
Heavy melt'g steel, Cleveland	37.00 to 38.00
Heavy melting steel, Cincin.	31.00 to 31.50
Heavy melt'g steel, east. Pa.	30.50 to 31.50
Heavy melt'g steel New York	30.00
Heavy melting steel, St. L.	36.00 to 37.00
Heavy melt'g steel Birming.	20.00 to 21.00
Hydraulic pressed sheets, Cleve.	28.00 to 29.00
Hydraulic press. sheets, Pitts.	25.50 to 26.00
Hydraulic pressed sheets, Chgo.	25.50 to 26.00
Low phos. steel, Buffalo	50.00 to 55.00
Low phos. steel, Pittsburgh	37.00 to 38.00
Low phos. steel, eastern Pa.	43.00 to 45.00
Shoveling steel, Chicago	34.00 to 35.00
Shoveling steel, St. Louis	32.00 to 33.00
Steel rails, short, Chicago	40.00 to 40.50
Steel rails, short, Cleveland	43.00 to 44.00
Steel rails, short, St. Louis	41.00 to 42.00
Steel rails, old, Birmingham	25.00 to 26.00
Stove plate, Cleveland	19.00 to 20.00
Stove plate, Cincinnati	15.25 to 15.75
Stove plate, St. Louis	21.50 to 22.00
Stove plates, N. J. points	18.00 to 18.50
Stove plate, Birmingham	13.50 to 14.50
Stove plate, Buffalo	18.00 to 18.50
Stove plate, eastern Pa.	20.00 to 21.00

Corrected to Tuesday noon

Stove plate, Pittsburgh	22.00 to 23.00

(Net Tons)

Biiler plate, cut, No. 1, Chgo.	25.00 to 25.50
Boiler plate, cut, No. 1, St. L.	22.00 to 22.50
Bundled sheet, Cincinnati	19.00 to 19.50
Knuckles, coup., Chicago	38.50 to 39.00
Knuckles, coup., St. Louis	34.00 to 35.00
Springs, Chicago	39.50 to 40.00
Stove plates, Chicago	21.75 to 22.25

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:	
Albany, N. Y.	$1.26
New England (rail)	2.58
New York and Brooklyn (rail)	2.58
Virginia furnaces to:	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	4.25
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40
Chicago to:	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:	
Minneapolis-St. Paul	$1.25
Mayville, Wis.:	
Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama	61.0 cents

IRON MILL USE

(Gross Tons)

Busheling No. 1, Buffalo	27.00 to 28.00
Busheling, No. 2, Buffalo	18.00 to 19.00
Busheling, No. 1, Pittsburgh	27.00 to 28.00
Cast borings, New York	15.00 to 15.50
Cast borings, eastern Pa.	17.00 to 18.00
Cast borings, Buffalo	14.50 to 15.00
Cast borings, Pittsburgh	20.00 to 22.00
City wrgt., long, New York	36.00
Forge flashings, small, Cleve.	23.00 to 24.00
Forge flashings, large, Cleve.	22.00 to 23.00
Forge, No. 1, eastern Pa.	21.00 to 22.00
Grate bars, Buffalo	18.00 to 18.50
Grate bars, N. J. points	18.00 to 18.50
Iron axles, Pittsburgh	50.00 to 55.00
Iron axles, Cincinnati	44.00 to 45.00
Iron axles, eastern Pa.	40.00 to 42.00
Iron axles, Buffalo	50.00
Iron rails, Chicago	42.00 to 42.50
Iron rails, Buffalo	29.50 to 30.00
Iron rails, Cincinnati	32.00 to 32.50
Iron rails, St. Louis	41.00 to 42.00
Iron rails, Cleveland	45.00 to 47.00
Machine turnings, Buffalo	17.00 to 18.00
Mch. shop turnings, New York	14.00 to 14.50
Mach. shop turnings, Pitts.	20.00 to 21.00
Mch. shop turnings, eastern Pa.	17.00 to 18.00
Machine turnings, Birming.	8.50 to 9.50
R. R., mch. cast, No. 1, Buff.	30.00 to 31.00
R. R. wrought, 1, Buffalo	44.00 to 45.00
R. R. wrgt., No. 1, east. Pa.	44.00 to 46.00
R. R. wrought, No. 1 Pitts.	42.00 to 45.00
R. R. wrought, 1, B'ham.	30.00 to 31.00
Wrought pipe, Buffalo	31.00 to 32.00
Wrought pipe, eastern Pa.	30.00 to 32.00
Wrought pipe, New York	26.00 to 27.00

(Net Tons)

Angle bars, iron, Chicago	$43.50 to 44.00
Angle vars, steel, St. Louis	33.00 to 34.00
Arch bars and transoms, St. L.	41.00 to 42.00
Arch bars and transoms, Chgo.	44.00 to 44.50
Busheling, No. 1, Chicago	29.00 to 29.50
Busheling, No. 1, Cincinnati	20.00 to 20.50
Busheling, No. 1, Cleveland	22.00 to 22.50
Busheling, No. 1, St. Louis	26.00 to 26.50
Busheling, No. 2, Chicago	23.00 to 23.50
Cast borings, Cincinnati	13.50 to 14.00
Cast borings, Cleveland	20.50 to 21.50
Cast borings, St. Louis	16.00 to 17.00
Cast borings, Chicago	16.50 to 17.00
Cut forge, Chicago	37.00 to 37.50
Grate bars, Cleveland	20.00 to 21.00
Iron axles, St. Louis	47.00 to 48.00
Iron axles, Chicago	50.00 to 51.00
Iron axles, Cleveland	51.00 to 52.00
Machine shop turnings, Chgo.	16.50 to 17.00
Mach. shop turnings, Cleve.	17.00 to 18.00
Machine shop turnings, Cincin.	13.50 to 14.00
Mach. shop turnings, St. L.	18.00 to 18.50
Pipes and flues, Cleveland	28.00 to 29.00
Pipes and flues, Chicago	26.50 to 27.00
Pipes and flues, St. Louis	24.00 to 24.50
Railroad wrought, 1, Cleve.	34.00 to 35.00
Railroad wrgt., No. 1, Chgo.	40.50 to 41.00
Railroad wroght, 1, Cincin.	33.00 to 33.50
Railroad wrought, 1, St. L.	36.00 to 37.00
Railroad wrgt., No. 2, Chgo.	37.00 to 37.50
Railroad wrought, 2, St. L.	35.00 to 36.00

IRON OR STEEL WORKS USE

(Gross Tons)

Axle turnings, Cleveland	$22.00 to 23.00
Axle turnings, Buffalo	22.00 to 23.00
Shafting, New York	40.00
Shafting, eastern Pa.	40.00 to 41.00
Steel car axles, Birmingham	35.00 to 36.00
Steel car axles, New York	51.00 to 52.00
Steel car axles, Buffalo	50.00
Steel car axles, Cleveland	52.00 to 54.00
Steel car axles, Pittsburgh	50.00 to 55.00
Steel car axles, eastern Pa.	41.00 to 43.00

(Net Tons)

Shafting, St. Louis	36.00 to 38.00
Steel car axles, St. Louis	46.00 to 48.00
Steel car axles, Chicago	47.50 to 48.00

IRON FOUNDRY USE

(Gross Tons)

Car wheels, (iron), Pittsburgh	34.00 to 36.00
Car wheels, (steel), Pittsburgh	39.00 to 42.00
Car wheels, Chicago	36.00 to 37.00
Car wheels, eastern Pa.	32.00 to 33.00
Car wheels, Buffalo	31.00 to 32.00
Car wheels, New oYrk	29.00 to 30.00
Car wheels, St. Louis	34.00 to 35.00
Car wheels, Birmingham	22.50 to 23.50
Car wheels, Cleveland	31.00 to 32.00
Tram car wheels, Birmingham	22.00 to 23.00
Cast, 1, heavy, N. J. points	29.00 to 30.00
Cast, 1 machy., N. J. points	30.00 to 31.00
Cast, No. 1, eastern Pa.	32.00 to 33.00
Cast, No. 1, Pittsburgh	33.00 to 36.00
Cast No. 1, Cleveland	28.00 to 29.00
Cast, No. 1, Birmingham	25.00 to 26.00
Malleable railroad, Cincinnati	19.00 to 19.50
Malleable railroad, Cleveland	35.00 to 36.00
Malleable railroad, Buffalo	34.00 to 35.00
Malleable railroad, Pittsburgh	2800 to 30.00
Malleable railroad, east. Pa.	30.00 to 32.00

(Net Tons)

Cast, No. 1, Chicago	30.50 to 31.00
Cast No. 1, Cincinnati	24.00 to 24.50
Cast, No. 1, St. Louis	28.00 to 29.00
Malleable railroad, Chicago	30.25 to 30.75
Malleable railroad, St. Louis	26.50 to 27.00
Malleagle agricultural, Chicago	26.00 to 26.50

MISCELLANEOUS USES

(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	48.00 to 50.00
Reroll. rails, 5 ft. & ov., Chgo.	45.00 to 45.50
Reroll. rails, 5 ft., & ov., E. Pa	40.00 to 42.00
Reroll. rails, 5 ft. & ov., St. L.	44.00 to 45.00
Reroll. rails, 5 ft. or ov., Cleve.	45.00 to 46.00
Rerolling rails, long, Birming.	30.00 to 31.00

(Net Tons)

Boiler punchings, Chicago	36.00 to 37.00
Locomotive tires, Chicago	47.00 to 48.00
Locomotive tires, St. Louis	44.00 to 46.00

"Where-To-Buy"

A classified-by-products list of advertisers for the convenience of readers. If you don't find what you want, write us and we will tell you where to get it. ¶ Index to advertisements will give you page number of any advertiser and by referring to advertisement you can get full particulars about products.

ACCUMULATORS.

Birdsboro Steel Fdy. & Mach. Co., Birdsboro, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Tod, Wm., Youngstown, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

ACETYLENE IN CYLINDERS.

Linde Air Products Co., New York City.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

ADAMITE ROLLS.

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

AEROPLANE WIRE, STRAND AND CORD.

American Steel & Wire Co., Chicago, Ill.

AIR SEPARATORS.

Raymond Bros. Impact Pulverizer Co., The, Chicago, Ill.

ALLOYS.

American Vanadium Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Bourne-Fuller Co., The, Cleveland ,O.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Haynes Stellite Co., The, Kokomo, Ind.
Standard Alloys Company, Pittsburgh, Pa.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Alloys Steel Corp., The, Canton, O.

ALUMINUM (Granulated).

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM (Solder).

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM (Vanadium).

American Vanadium Co., Pittsburgh, Pa.

ALUMINUM ALLOYS.

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM INGOTS.

Pittsburgh Aluminum Co., Pittsburgh, Pa.
United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS (Sheet).

United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS (See Steel, Structural).

ANNEALERS (Pot and Muffle).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

ANNEALING BOXES AND POTS.

Blackwood Steel Fdy. Co., The, Springfield, O.
Garwood Bronze & Iron Works, Garwood, N. J.
Knox Pressed & Welded Steel Co., Pittsburgh.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ANTI-SLIP TREADS FOR STAIRS.

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

ARCHITECTURAL SHAPES.

Empire Art Metal Co., College Pt., N. Y.

ARMATURES.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.

Lakewood Engrg. Co., Cleveland, O.

AUTO TOWING CABLES.

American Steel & Wire Co., Chicago, Ill.

AUTO TRUCKS.

Federal Motor Truck Co., Detroit, Mich.

AXLES.

American Bridge Co., New York City.
American Steel Export Co., New York City.
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Federal Export Corporation, New York City.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

AXLE LATHES.

Bridgeford Mch. Tool Wks., Rochester, N. Y.

BABBITT METAL.

Keystone Bronze Co., Pittsburgh, Pa.
Lubricating Metal Co., The, New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.

BAKERS, WIRE COATING.

Morgan Construction Co., Worcester, Mass.

BAKERS (Wire Coating and Bluing).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALE TIES.

American Steel & Wire Co., Chicago, Ill.

BALLS (Brass and Bronze).

Auburn Ball Bearing Co. Rochester, N. Y.

BALLS (Steel).

Auburn Ball Bearing Co., Rochester, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDERS (Hydraulic for Projectiles).

Southwark Foundry & Mch. Co., Philadelphia.

BAND (Steel).

Akron-Selle Co., The, Akron, O.
Carnegie Steel Co., Pittsburgh, Pa.
Interstate Iron & Steel Co., Chicago, Ill.

BARBED WIRE FENCE (Equipment).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARGES (Steel).

American Bridge Co., New York City.

BARS (Concrete Reinforcing).

Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Texas Rolling Mill Co., Fort Worth, Texas.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS (Iron and Steel).

American Bridge Co., New York, N. Y.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Federal Export Corporation, New York City.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Texas Rolling Mill Co., Fort Worth, Texas.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Tin).

Andrews Steel Co. Newport, Ky.

BEAMS, CHANNELS AND ANGLES.

American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Federal Export Corporation, New York City.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

BEARINGS (Ball).

Auburn Ball Bearing Co., Rochester, N. Y.
New Departure Mfg. Co., Bristol, Conn.

BEARINGS (Ball Thrust).

Auburn Ball Bearing Co., Rochester, N. Y.

BEARINGS (Vanadium Steel).

American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.

Dixon, Jos., Crucible Co., Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.

BELT LACING (Leather).

Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING (Chain).

Link-Belt Company, Chicago, Ill.

BELTING (Leather).

Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BENCHES (Steel).

New Britain Mach. Co., New Britain, Conn.

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